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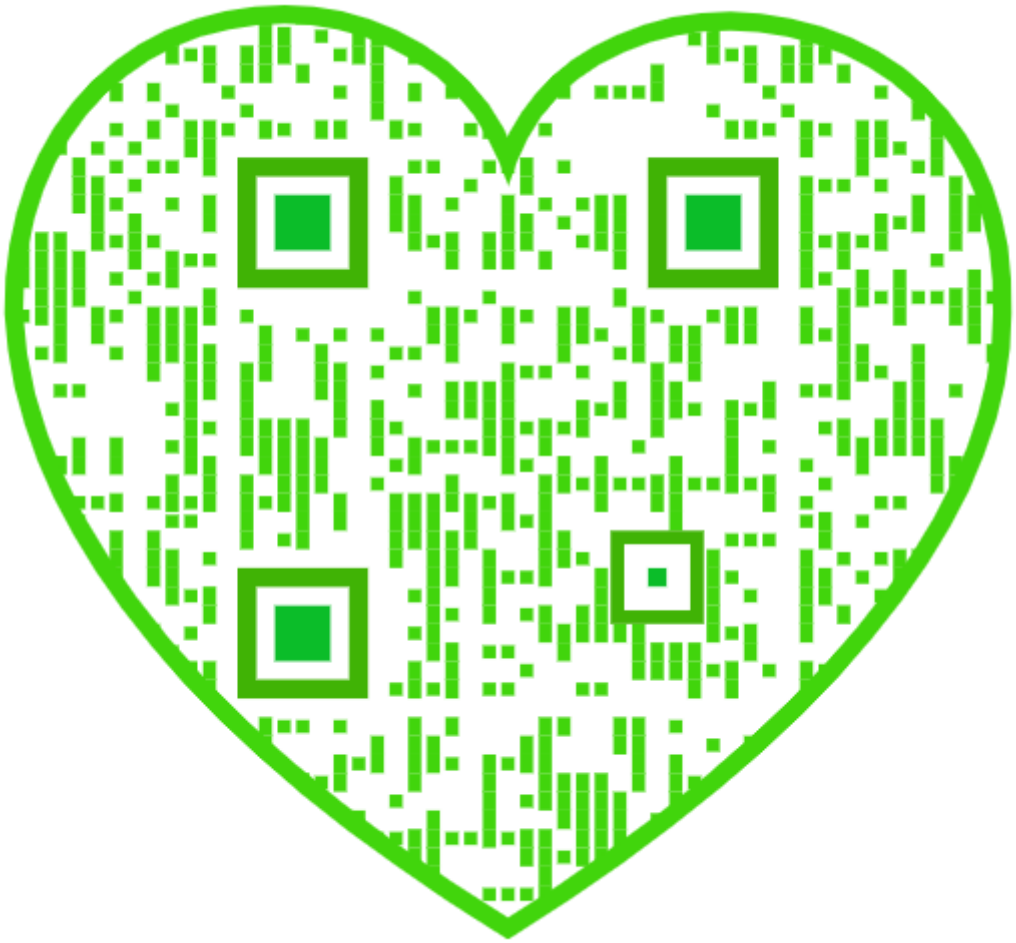

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REPOUSSÉ AND SHEET METAL WORK FROM A BRONZE BY GHIBERTI.
Frontispiece.

ELEMENTARY
METAL WORK

A PRACTICAL MANUAL FOR AMATEURS AND FOR USE IN SCHOOLS

BY

CHARLES GODFREY LELAND,

Late Director of Industrial Art Work in the Public Schools of Philadelphia. Author of "Practical Education," "The Minor Arts," "A Manual of Design," "Wood Carving," "Leather Work," &c., &c., &c.

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PREFACE.

THIS work contains an explanation of the processes of cold metal work, chiefly as applied to decorative or industrial art, and especially with a view to their being taught to children in elementary and preparatory schools. The author believes that it may be regarded as thoroughly adapted to this purpose, he having been founder and director for four years of the industrial art classes in the public schools of Philadelphia, in which some of these branches of metal work were taught with great success, so that many of the pupils on leaving school immediately obtained well-paid employment. As many as six girls at once thus went from the metal class to a factory, the proprietor of which declared that all the preliminary education, which gave him more trouble than anything else, had been perfectly imparted. On another occasion, a principal in an ornamental metal factory, after careful examination of the design and work of the pupils, offered to take *forty* together, and guarantee "living wages" from the beginning, and a rapid increase of payment, if their parents would consent. All that these children knew, and much more, is set forth clearly and briefly in this work, so that no person, young or old, who wishes to learn metal work either as an art or a trade, can with a proper degree of interest and industry fail to do so.

The principle which guides this and other books on the industrial or minor arts by the same author, is that the *rudiments, or first and easiest stages of anything to be mastered, must be very thoroughly acquired, and no step forward be allowed till the pupil is really a master in all that has preceded it.* Self-evident as this principle seems, it is as yet so far from having been understood or followed, that most writers on education in anything neglect it, and in a recent book on metal work for amateurs, not only is there no full description of what may be done in the early stage, but the latter is even spoken of contemptuously, as only fit to produce inferior objects.

I beg the reader to specially observe that in every subject treated there is something of special importance, which is either now published for the first time, or which was first taught and made known in my other works on industry and art. I refer here, for example, to *figures* in bent iron work, to an advanced style of cut metal work, to embossing for beginners on wood, nail-ornaments, and scale work.

In the Middle Ages in Europe, as in the East, the vast extension of decorated work was entirely due to the fact that the rudiments were so perfectly mastered, and the very utmost made of their resources. Thus an immense proportion of the carving, and, indeed, of most kinds of ornamental work, was actually such as would be included in the first two or three lessons in an industrial or minor art school. Nowadays all pupils hasten on as rapidly as possible to the "higher stages," despising the lower, the result being vast quantities of petty elaborate foliage and fine work, valued for great skill and labour, while on every house-front, and door, and elsewhere, we see dead blank space. The art education of the present day is all wrong in this, that it constantly holds up before pupils the idea that they are to become great *artists*, when what the country needs is good *artizans*. Practical result guided by good taste

is what the latter require, and I believe that I have had this before me in every paragraph of my work. I will now explain the nature of its subject and clearly set forth its subdivisions.

METAL WORK may be divided into two kinds, the *hot* and *cold*. Heated or hot metal, which is naturally produced by the aid of fire, includes that which is melted and cast in moulds, or simply heated and forged till it is soft enough to be hammered into shape, as a horseshoe is made. To this latter, but much connected with cold metal work, belong soldering and brazing, which is the joining of one piece of metal to another by heating, and using some intermediate substance, such as *solder*, or borax and resin, as a *flux* and cement which readily promotes an union. Two pieces of red-hot iron hammered together join with difficulty, but with a flux or binder, such as solder or borax, they unite at once when hammered.

COLD METAL WORK has many subdivisions, chief among which, in decorative and easy art, are :

I. Band, strip, or ribbon work.
II. Cut sheet work, and stencil cutting.
III. Repoussé or embossed sheet metal work.
IV. Nail or knob work.
V. Scale work.
VI. Sheet silver work.

To these might be added the remarkably difficult art mentioned by Vasari, of filing or cutting images out of solid ingots of iron, which is probably not practised by anyone at the present day, and therefore is not included among the current metal works.

As regards practical experience and qualification in these, I venture to mention, with all due reserve, what is, however, well known to hundreds in authority, that it was in my work on the "Minor Arts," published in 1879, and in my "Manual of Metal

Work," and "Repoussé Album," that sheet brass work was first shown to be possible *on wood*, which greatly reduced the price of materials and the difficulty of the rudimentary stages of *repoussé* or embossing. And though it is usual for those who really do not know what can be done on wood to deny it, it is certainly true that it was the cheapness and ease of hammering on soft wood which caused the art to spread with such incredible rapidity over the United States, and, soon after, through Great Britain and Europe.

It may, however, here be mentioned that I had previously practised repoussé on wood in England, and explained it to a few friends, among them Mr. Karl Krall. It was also introduced at once into the Home Arts and Industries Association (Albert Hall, S.K.), where it is, I believe, still taught. Into this latter institution the Venetian bent iron or strip work was introduced at an early date by Miss Annie Dymes, the secretary, and there it is now taught by Miss M. H. C. Legh, the author of an admirable and very succinct "Handbook of Brief Elementary Instructions for Classholders in Bent or Strip Iron." I beg the reader to observe that while none of the works on this subject carry it beyond the extremely simple, rudimentary, and very monotonous ornamentation of the C and S and similar curves of Venetian iron work, this book teaches a very much more advanced, though not more difficult, art of making figures, floral ornaments, and, in short, a great advance on all that has been thus far made in the work.

Nail or knob work, and easy silver work for ladies, which are fully described in this work, are subjects on which I was, as I believe, the first to write or publish, and it will be seen that even yet they are as here set forth almost entirely among the arts as yet unknown. The latter is not only extremely easy, but when guided by good taste may be made very profitable. These (like advanced bent iron work, with figures, as here taught) are

as yet so very little known that thousands of people could easily get a living by practising or teaching them.

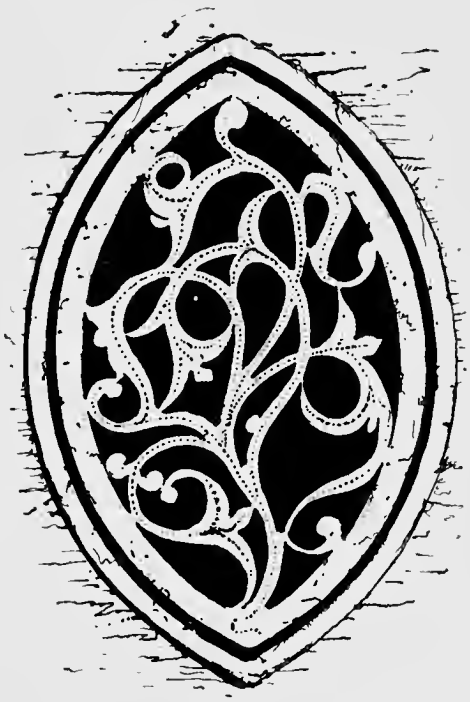
This work is not intended "for amateurs to pass an idle hour," but to train the young to use their brains and hands, to develop ideas of design and its application, and, in short, to awake and exercise that constructive faculty which enables them to most readily learn a trade of any kind, and which, as great experience has shown, awakens all the mental faculties.

It may be observed, as regards the subject of this work and its *practical* use, that cold metal work in such rudimentary ornamental forms as bent iron or strip, repoussé, and wire work, can be mastered in a short time even by children, as I know by extensive personal experience. Secondly, it forms the very best preparation for working in heated metal or forging, leading insensibly and easily to it. Among our early ancestors every well-educated man was a *smith—smith, earl,* and *thrall,* or the artizan, the noble, and the labouring man, were the family names of the whole human race—and there is no reason why every man should not be more or less of a smith now. All such work opens the eyes and makes deft the hands to all kinds of crafts, and the first step to it will be found in the extremely easy and entertaining art taught in this book, which is indeed so easy that there is nothing in it which any young lady or schoolboy cannot master. What children have done, children may do.

In "Repoussé Work for Amateurs," the author, L. L. Haslope, speaking of the various series of designs for embossing metal, says that "the best sets I have met with are by Charles G. Leland, a well-known writer on art. . . . They include designs for a great variety of subjects; . . . some of them are very quaint and original, and would form good practice for a beginner." I venture to hope that the illustrations in the present work will be found in all respects superior to those so kindly

described, and even more adapted to the use of the inexperienced. They have all been executed in Italy, and in the home of such art, and I have spared no pains to reap good models.

In conclusion I have to express my sincere thanks to Mr. Karl Krall for having read the proof sheets, and for several useful additions and suggestions.



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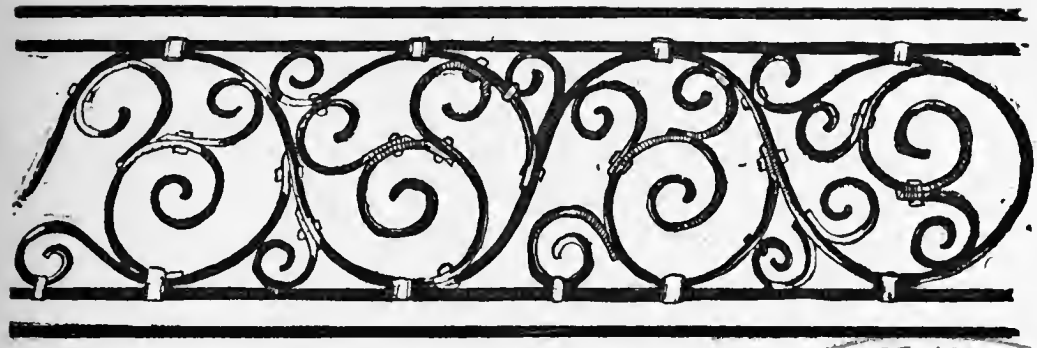

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Metal Work.

BENT IRON OR STRIP WORK.

INTRODUCTION—TOOLS—MATERIALS—CURVES.

IF the pupil or reader would get an idea of the first principles of strip or bent metal-work, let him or her take a strip of cardboard six or eight inches in length, and one third of an inch in breadth. Bend this into a spiral. Then make another of the same size, or smaller, and fasten them back to back by passing a pin through them, and bending the pin flat by means of a pair of flat pincers or pliers. It is evident that this process of making spirals, and attaching them one to the other, can be continued to any extent, and by this alone we can produce an infinite amount of beautiful ornamentation, as will be shown by some of the examples in this book.

When the strips of cardboard are attached, and made into some definite shape or object, they can be blackened with paint,

and will then resemble iron. It is advisable for pupils, particularly the young, to practise such manufacture in thin cardboard —of playing-card thickness—before beginning with metal, as it rapidly familiarizes the fingers with bending and forming curves, and leads the mind to what is most important of all (yet which is much neglected), that is, the getting a good general idea of what the work in hand is, and fully mastering its requirements and meaning as regards design in the easiest manner. I lay great stress on this, and beg pupils as well as teachers to understand that in metal-work, just as in wood-carving, or leather-work, those will in the end get on the most rapidly, and produce the best results with the greatest ease, who will *thoroughly master the first lessons.* For it is always easy to do this with a little patience, and then still easier to go on step by step to more advanced work, while, on the other hand, if the hand and fingers are not practised, ready and apt at the rudiments, there will be bungling and trouble for a long time. The difference between a mere amateur and a real *artist* amounts chiefly to this, that the latter works *confidently* and boldly, and knows exactly what he wants to do, and is *sure* that he will do it. Now let the pupil be certain *of this*, that the very best way by far to become such a bold and ready artist is *to learn every lesson from the very beginning very thoroughly, and practise it over and over again.* Let him not be in a hurry to produce masterpieces, or rather let him be satisfied to produce masterpieces of rudimentary easy work, which may also be done, for in all arts the most beautiful and even valuable objects are very often among those most easily made.

TOOLS.—The tools required for rudimentary bent metal-work are very few and inexpensive, but for the more advanced pupil others will be required. Where there is a class the following should be provided.

One large square-headed and *one smaller hammer.*

One vice. A small one will serve for the first lessons.

An anvil, which may be placed on a heavy block of wood. Smaller anvils may be obtained, which can be set in the bench, or held in the vice. Figs. 1 and 2. With these may be classed "*stakes,*" such as the *side* and *hatchet stake,* and *back iron,* which are peculiar forms of projecting rods, or irons for hammering or

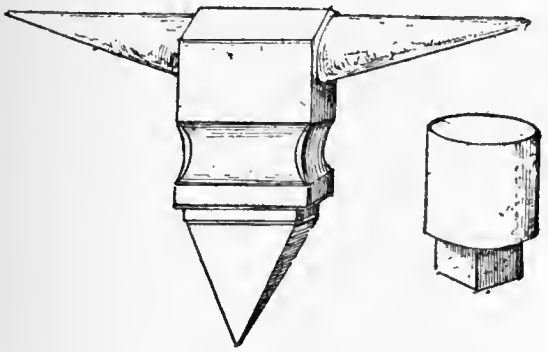

Fig. 1. Fig. 2. ANVILS.

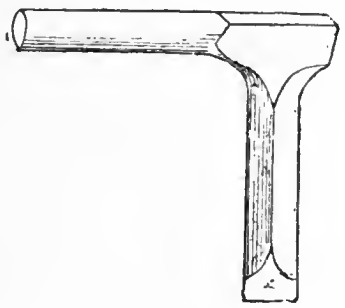

Fig. 3. HATCHET STAKE.

shaping certain objects. Fig. 3. A *bolt stake* with a round end is extremely useful in hammering leaves and flowers.

For small work, an iron weight of from one to three pounds, with one side smoothed by any smith, and set in a wooden block, makes a very good anvil.

When an anvil cannot be obtained a flat-iron reversed is a very good substitute. I learned this many years ago from the Red Indians of New Brunswick, who used them for hammering out coins wherewith to make brooches and other ornaments.

A pair of strong metal shears, from seven to nine inches in length, for cutting thin sheet metal. The larger kinds are set firmly on the side of the work-bench, and are worked by means of a handle, as may be seem in tinsmiths' shops. For beginners the hand-shears will be sufficient. Fig. 4.

A pair of very strong scissors of best steel, also for cutting thin metal. The use of these may at first hurt the fingers, but with a little practice one can cut out thin soft iron or tin or brass into any shape with great ease, and without pain.

Fig. 4. SHEARS.

Cold chisels, or well-tempered *cutters*, used with a hammer for cutting out forms from sheet metal too hard for the shears.

Cutting pliers, for cutting wire and snipping off ends of metal.

Flat nippers, pincers or *long-nosed pliers. Large and small round-nosed* (or "*pipe*") *pliers.* Three or four sizes. Fig. 5.

Common pincers. Two sizes.

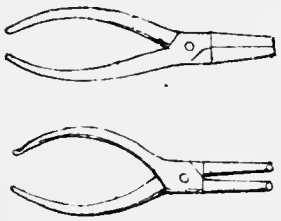

Fig. 5. PLIERS.

A metal drill for holes. These may be had from two to ten shillings; adjustable points of different sizes cost about one penny each.

Punches or *bradawls* for making holes for rivets. One variety of punch for thin soft metal cuts out a round piece. A good steel nail may be used (round).

Fig. 6. PUNCH.

Rimer, in handle, for enlarging holes.

Files. Flat, half-round or bastard, and rat-tailed or round.

A small square block of iron into which holes are drilled, and others in which these hollows are of different sizes, saucer-scooped, and gradually deeper (to be fastened in the vice).

A centre-bit with three or four circular (or barrel) cutters, for cutting out large round holes.

A screw-wrench for nuts and bolts.

Iron, steel, and tin rivets.

A small forge or a *fire* when possible.

A work bench or strong table.

Wire. Ductile bell-wire, iron, brass, or copper.

A very important article is a round bar of wood firmly set in the work bench or wall. It should be from nine inches to a foot in its projection. It is useful for rivetting and rounding curves. The pointed and rounded end of a large anvil is also adapted to such work.

There is an instrument used to cut open tins of fruit, caviare, etc., which takes out a round piece from the size of a crown-piece to one of four inches diameter. This will be found very useful in broad work.

Apparatus for soldering.

A solid block of wood for rivetting and other special work.

Templet rods and pins. These are tapering rods or sticks, round which the strip is bent to make spirals, etc.

The pupil of limited means need not be alarmed at the number of tools here enumerated, nor their expense. For a beginner one pair of flat pliers or pincers, and one of the long-nosed, with table or block, a hammer, bradawl, and snip or shears, will suffice to produce very beautiful work. It is much better not to have too many implements at first, and to learn to thoroughly master what one has, and to know how to make the utmost of them. This leads to ingenuity and inventiveness, and to developing something which is even better than artistic skill.

MATERIALS AND INSTRUCTION.[1]—Strip or band metal, or ribbon iron, consists, as its name indicates, of strips of thin sheet of varied thickness. Iron has sometimes been made as thin as

[1] Instruction in all kinds of metal-work—specially artistic—as well as tools and materials, may be had of Mr. KARL KRALL (Barkentin and Krall, 291, Regent Street, metal-worker for the Ecclesiological Society). Also lessons at the Home Arts and Industries Association, Albert Hall. Tools and materials of best quality are also to be had of JOHN J. HOLTZAPFFEL AND CO., 64, Charing Cross.

any note paper. It is usually made in widths of $\frac{1}{8}$ of an inch (used chiefly for bands, clips, or ties to connect the work), $\frac{3}{16}$ in. and $\frac{3}{8}$ in. Strip or ribbon iron is sold at greatly varying prices, from 10*d.* to 3*s.* a pound, not by any means in relation to the value, but to the price which it is supposed it will bring. If the pupil is provided with a stout pair of shears, he can buy thin sheet iron for about 3*d.* or 4*d.* a pound, and cut it up himself into strips, or have it done as cheaply by any blacksmith or tinsmith. For practice, and even for a great deal of work, old tin cans may be utilized.

It may be here observed, that whatever can be made in iron, may with equal success be attempted in brass, copper, and especially in "red metal," and two or three other compounds of very great ductility. Tin-plate is also of course adaptable, it being only iron dipped into tin. I have seen a great deal of beautiful repoussé work made from thin sheet pewter, coloured to imitate brass and copper. It is of course very weak, but serves admirably for ornament when placed out of reach.

Bent iron work is said to be the easiest of all the arts in metal, and so it is—after *one* difficulty has been mastered. This is simply to bend and curve the strips smoothly, so that there shall be an even surface without irregularities or *kinks*, so as to have the whole "smooth as wax." This is the first step. To do this, the pupil must positively not begin by trying to produce a finished article, but practise forming the curves with pieces of strip till he can make and smooth them perfectly. If this is done, *step by step*, from first making a mere ring, then one curve after another, as will be described, and then twisting strips, what would otherwise be very difficult (as it is generally hurried over in a brief description) will be found easy enough. And it may be here observed, that if this is *thoroughly* learned in cold bent strip work, it is perfectly easy to do the same in heated metal.

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LESSON I.

THE principle of design in bent iron-work, as in most curved decorative work, is that of the growth of plants; or organic development; that is, of a trunk or stem from which grow branches and leaves. The first step in work is to form a ring or circle of either a ribbon of cardboard or sheet iron. This is the simplest and easiest bending conceivable. Let it be about three inches in diameter. Having drawn the circle with compasses on paper, adjust the ring to it.

Let one end lap over the other; take a punch or bradawl, or the drill. Placing the awl vertically on a projecting piece of wood (or on the anvil, in which a small hole should be drilled), give a blow with great care, and it will penetrate the iron. If the first blow does not go through both thicknesses, repeat it. This will make a hole, but ragged on the under side. Smooth this with the *rimer* or round file, and file away the ragged projection on the under side. Then place in the hole a rivet, and drive it through both holes. This will bind the two ends. Then, reversing the process, put the head of the rivet on the smooth anvil, and give the projecting end of the rivet a smart vertical blow, which will mash it flat and cause it to *spread*. In doing this, to avoid hurting the fingers, hold the circlet with the pliers or flat pincers. Smooth the end with a file. Then you will have a bangle or bracelet. Fig. 7. Make several of these for practice.

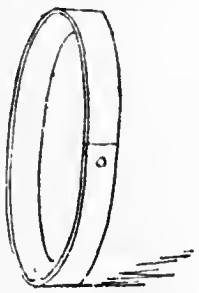

Fig. 7. BENT IRON RING.

This practice may be, for economy's sake, as well effected with strips of waste tin cut from old pails or cans, or iron of hoops, etc. These cans, as I have shown in the "Manual of Leather

Work,"[1] can be utilized in many ways in the arts, instead of being thrown away. It may here be observed that a good strong drill makes neater holes than the bradawl or punch and hammer, and as it takes no more time on the whole, is decidedly preferable, especially when the metal is thick or unusually hard.

Riveting may be executed in several ways. *Firstly*, by laying the strip to be pierced on a block or board of wood, and then driving a steel punch or point, generally a bradawl punch, through it. This leaves on the under side a burr or projecting ring of rough metal round the hole. This is to be filed off and the hole smoothed with a rimer or rat-tail file. *Secondly*, there can be used a plate or bar of iron in which there is a slit through which a hole is drilled. By passing the strip through this slit or split, and then striking the punch as before, a better perforation is made. Fig. 8. *Thirdly*, by using the drill, especially for thick sheet iron. *Fourthly*, when the sheet or strip is very thin and very neat work is to be executed, the round or circular punch may be used. This, like the snap or hole-cutter used by shoemakers to cut holes through which strings pass, cuts out at a blow a small disc of metal like a tiny coin. In using it, the strip should be laid on a block of lead, or of the hardest wood. *Fifthly*, we may add to these an implement which is however but little used in metal-work, though familiar to every corset-maker and most milliners. This is a pair of pincers, by means of which a peculiarly shaped hollow rivet is pressed through a hole, and at the same time crushed and clamped down at the end. It is often used in counting rooms or offices

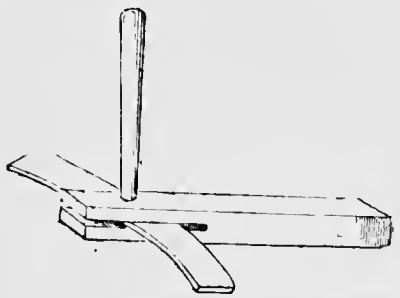

Fig. 8. MAKING RIVET-HOLE.

[1] "Manual of Leather Work," by Charles G. Leland. London, Whittaker and Co., 2, White Hart Street, E.C.

to fasten papers together. This method of riveting is very neat and may often be used in light sheet metal.

Rivets are of three kinds. (1) The round-headed "cup" or "snap" of a convex form; (2) The counter-sunk or flat-headed; (3) Wire-rivets, or simply sections of wire, which may be used when the better kind are not to be had. With these may be included common small tacks, which answer well enough for common work. The object of riveting is to have a connecting link which spreads out on both sides so as to bind two pieces of metal. The cup or flat-head forms one of these "spreads," the other is made by smashing the other end flat, so as to make it pass over the sides or round edge of the hole. To do this (as the pupil will probably very soon find for himself) it is necessary to not only hit the rivet, but to *strike sideways* a little, so as to spread the iron. This is sometimes aided by first making a blow in the centre of the rivet with a splitter, or dull chisel, or with the point of a punch. A *snap* is a punch with a semicircular end used to clean off and finish up rivet-work. It is struck with a hammer, and may be compared to a chisel when the latter is used to trim off work.

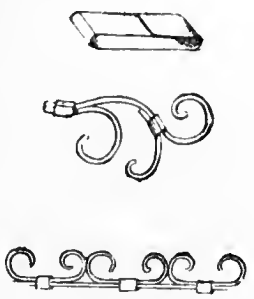

Fig. 9. CLAMP AND CLAMPED WORK.

Clamps, *Clasps*, or *Binders*. These are much more used in common Italian work than rivets, being easier to apply, and looking quite or almost as well in large or coarse objects. A clamp is simply a narrow strip of iron which is passed or bent very closely round two other strips, so as to bind, tie, or clamp them together. It is like binding two objects with a ring of which the ends are not united. One end of the clamp of course passes over the other. Figs. 9 and 10.

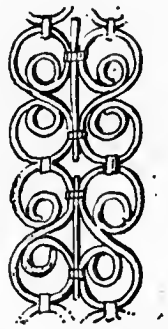

Fig. 10. CHAIN-WORK CLAMPED.

When this is done, the clamp is made firm, either with a blow of the hammer or by pinching it down closely with the flat pliers. The effect of the clamp is not bad artistically speaking,

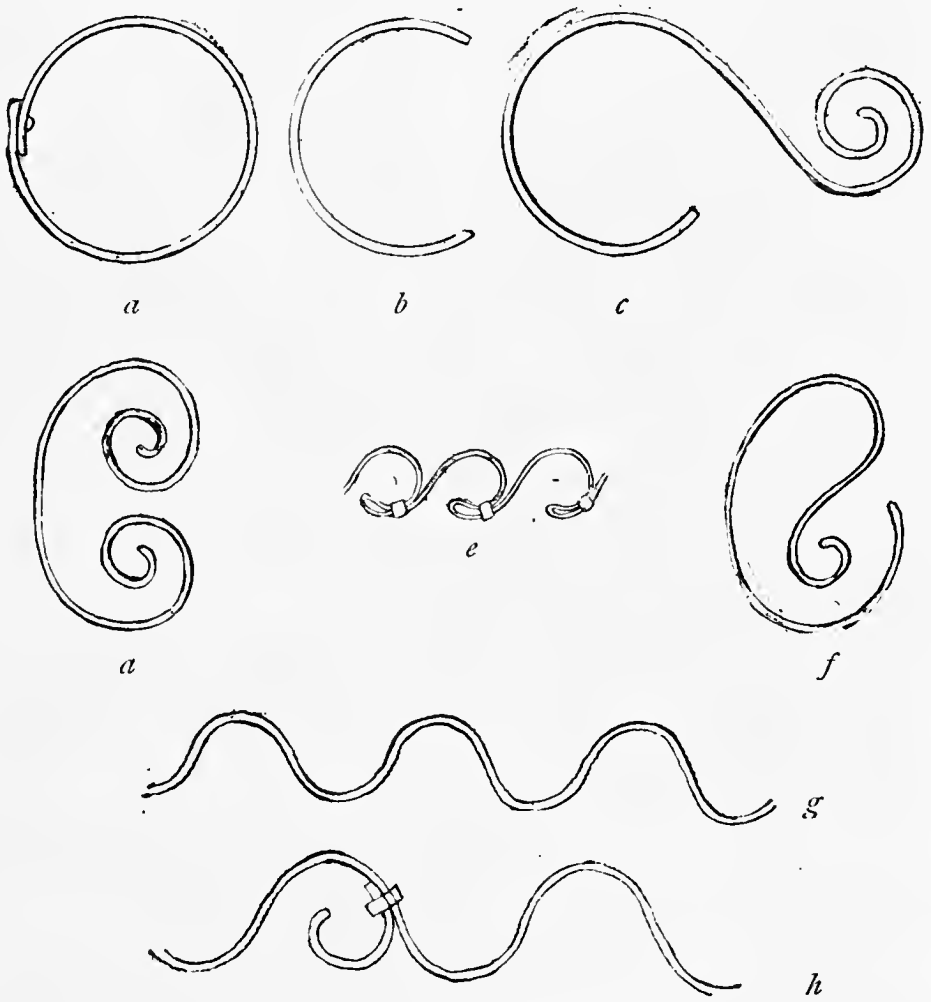

Fig. 11. Simple Bends.

and it was very often imitated as an ornament in Gothic designs, illuminated work, and the like. I have before me as I write very elegant specimens of Venetian work in which there are no rivets, everything being connected by clamps. The clamp

can always be employed, even when owing to the closeness of the lines it is impossible to get in a rivet or to solder.

CURVES.—When the pupil can make a ring, he can proceed to form semicircles or C's. As these C's run into spirals at one or both ends, and are modified into more than one form, Fig. 11, *b-f*, they require more skill than the plain circle. To make these, hold the strip of iron, or other metal, with the flat pincers or pliers in the left hand, and with the round-nosed, or pipe-pliers, bend or curve the strip at one end into a volute or roll, which can then be enlarged or "undone" to the curve required. If needed, then work the other end of the strip in the same way. If there are any irregularities or warps in the metal they can be pinched and pressed out with the flat pliers.

It will be readily understood that there is a certain *knack* of manipulation or art of neatly forming the curve which clever pupils will readily perceive and acquire, and which those who are less apt must learn from them, or from a skilled teacher or by practice.

The next step is to form an *S curve* which is in fact making two semicircles or C's out of one piece. Its ends of course may be developed into varied forms, spirals, etc., Fig. 11, *c*.

An end, be it of a C, or S, or of a straight line, may also be bent back and riveted in a *recurb* or pear-shaped, turned-back curve. This forms a pretty finial or end-ornament. It may also be frequently applied as a crochet or side ornament on a frame or strap, Fig. 11, *h*.

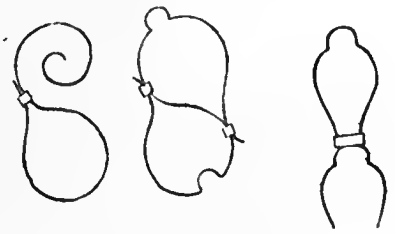

Fig. 12.

Vase or *Eye Curves* (Fig. 12). These are very beautiful forms, which may frequently be introduced to advantage in designs. To make them, first double or bend the strip,

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Fig. 12, with the round plier as before directed. Three or more may be joined so as to radiate from a centre.

Angles (Fig. 13). These which are in straight lines and square corners have the same relation to curved figures as crystals have to vegetation or organic life. They may be obtuse, acute, and in fact carried so far as to allow the strip to be bent back flat on itself or doubled close. It is always well, when it is possible,

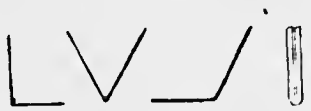

Fig. 13.

Fig. 14.

before doing the latter, to heat the iron in a fire or a gas-lamp enough to render it flexible, which precaution may indeed be adopted at any time where the iron seems to be refractory or with a tendency to crack and break. Angles may be accurately formed on the square edge of the anvil.

Concentric Spirals (Fig. 14). These are very pretty and effective, especially when they proceed from a closely twisted end.

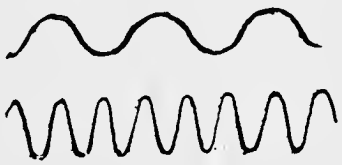

Fig. 15.

Fig. 16.

These latter or close spirals are often very effective when employed as *finials* or ends, and were much used in the best mediæval or Gothic iron-work, though they occur seldom in the modern *rococo* or *baroque* work which avoids everything which is in the least difficult, and seeks to make only that which can be turned out most rapidly. The true object of study for beginners should be to become thoroughly good artisans or artists, and not merely

to learn how to make what will sell most readily at bazaars or fairs.

Wave-lines (Fig. 15). These may be rounded, that is semi-circular, or pointed like saw teeth. They require care, though the process of bending them alternately with the round pliers is easy. They are much used for borders. Indented wave-lines,

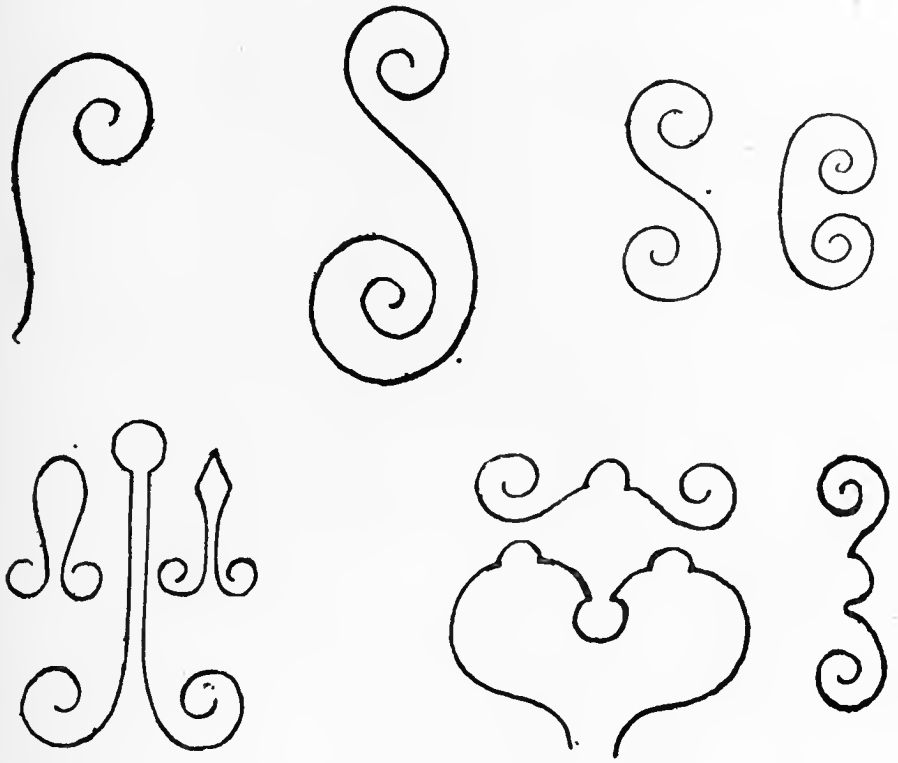

Fig. 17. SAMPLES OF CURVATURE.

are very pretty, they are made by first allowing a very long curve and making the indentation either with round nippers, or hammering with an iron rod in a groove.

Ogives or *Ace of Spade* curves (Fig. 16). These are not very common in bent work, yet they are easily enough made and are very effective in design when properly disposed.

LESSON II.

MAKING RINGS AND CURVES INTO OBJECTS.

IF we make three C's of strip-iron and rivet them at equal distances round on a circle, as shown in Fig. 18, we have something on which a cup, or small bowl may be placed, or into which a cylindrical glass, such as a bottle or tumbler may be put. The form or shape of the supports may be very much varied.

The simplest useful object which can be made is a hanging hook. This must be made of rather thick sheet iron. Curve one end and drill a large hole in the other, to receive the nail in which

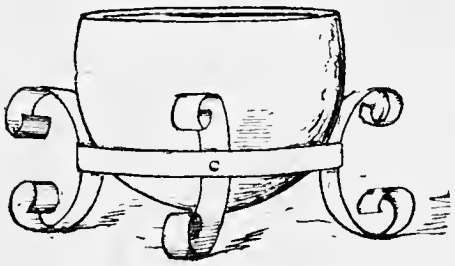

Fig. 18. STAND FOR A BOWL.

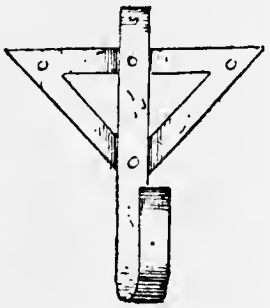

Fig. 19. Fig. 20.
HANGING HOOKS.

it is to hang. But as it will swing to one side or the other, it is better to drill two holes, and use two nails. It may be improved in appearance by making a cross, or a triangle of three straight strips on which it may be riveted, Fig. 20. It may be here remarked that brass, copper, or silver-headed tacks may often be used for rivets, to improve the general appearance of many objects.

To make a useful and very simple cylindrical holder, take one strip of from one foot to eighteen inches in length, and make

two or three rings as previously described in Lesson I. Rivet them together with uprights as shown in Fig. 21. Rivet one straight strip across the bottom. It may be still further improved by adapting to it a handle, Fig. 22. These constructions may be

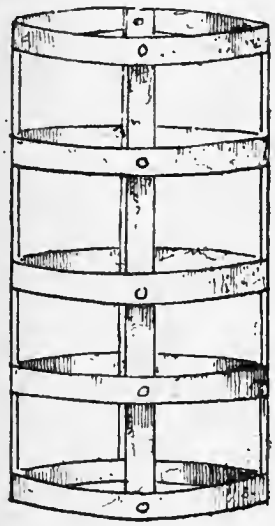

Fig. 21.

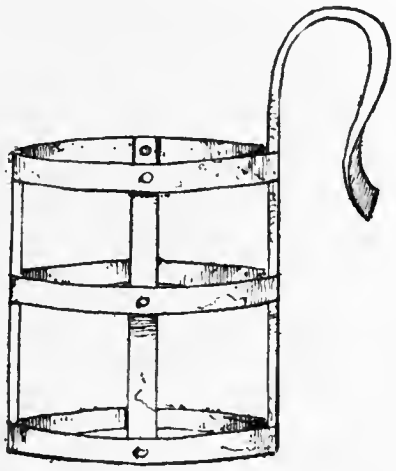

Fig. 22.

very much varied, so as to contain cylinders to hold spills of paper lead pencils, pens or inkstands, or small bottles of ink, tumblers or lamps. Their appearance may be improved by making the rings of strips of sheet brass, copper or red metal.

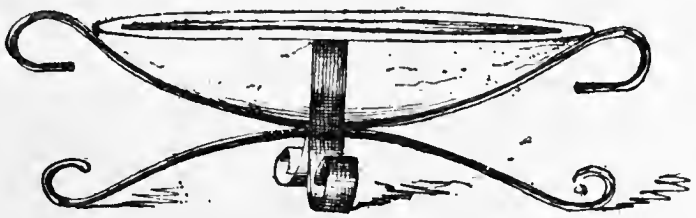

Fig. 23. CARD TRAY.

Take four strips each eighteen inches in length. Bend the ends of all and cross them, so that two may turn under down-

wards, and two upwards. A single rivet will hold the four. Fit a saucer into the upper cross, and you will have a pretty card-tray, Fig. 23.

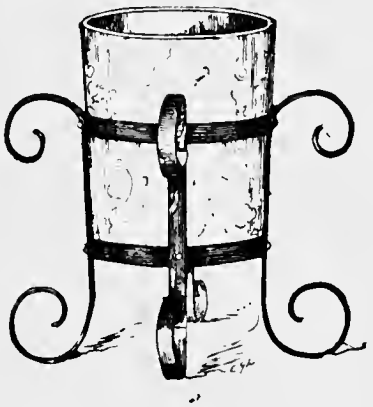

Fig. 24. TUMBLER STAND.

Fig. 25. WOODEN BOWL ON IRON STAND.

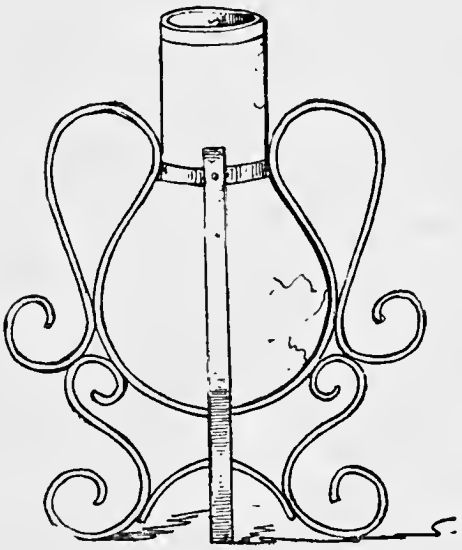

Fig. 26. GLASS FLAGON ON STAND.

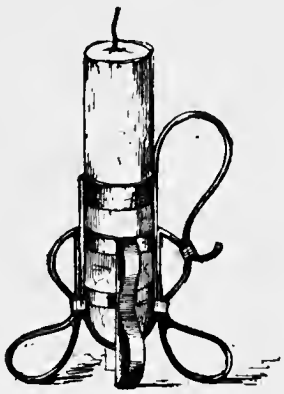

Fig. 27. CANDLESTICK.

If we have a cup or a goblet, or small bottle of any shape whatever, we have only to draw its outline on paper, and with a little ingenuity adapt strips to it to make a holder. Many objects of

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glass or porcelain which have had their supports broken away, can thus be utilized. See Figs. 24-27.[1]

It is sometimes impossible to rivet in the manner previously described, by a direct blow on the head of the rivet or nail, owing to the closeness of the strips. In such a case, if it cannot be crushed with strong flat nippers, take one very large nail or a small square bolt, also a piece of hard wood, which will pass through and form a rest. Screw the latter into the vice, and drill or drive the hole upon it; in most cases you make it from either side straight enough. Then put in the rivet, and, covering it with the nail or bolt, give the latter a hard blow close to the strip.

But in most cases such close strips, especially of thin $\frac{1}{8}$ in. iron, are bound by means of wire or clamps, before described, which are small pieces of thin iron wrapped closely round the two strips, their edges just meeting and then punched together.

When wiring is to be done, it may be a single ring with a twist of the two ends, which suffices for ordinary work. But for a better effect, especially if brass or copper wire be used, first make the rivet hole, then pass the end of wire through it, wind it tightly with the pliers three or four times round the strips, twist the ends together, and pinch or hammer them flat.

Care should be taken to get a flexible wire, such as is used for bells; if it be brittle it is useless for such delicate work.

Let all the work be very neatly finished. Of late years an immense quantity of rudely made iron strip-work has been produced in Italy and sold very cheaply, with the result of greatly injuring the art.

CROSSED STRIPS.—A very pretty and curious effect, not much used in strip or ribbon-work, and not even mentioned

[1] In Figs. 24, 26, and some others the plan is supposed to be triangular or three-footed; but two handles are given in profile to show the curves better.

by any writer known to me, is to make the strips cross one another. This is effected as follows: Take a flat, very thin file or fret-saw, and cut half through a strip at the point of intersection. Then cut in like manner through the other. Then cross the two. Fig. 28. If they do not cling firmly, fasten them with a twist of thin wire. This is a very important effect as regards design, since it enables the artist to develop the *vine* to any extent in strap-work, and not limit himself to masses of C's and S's, or of curves stuck together feebly with no regard to growth or development.

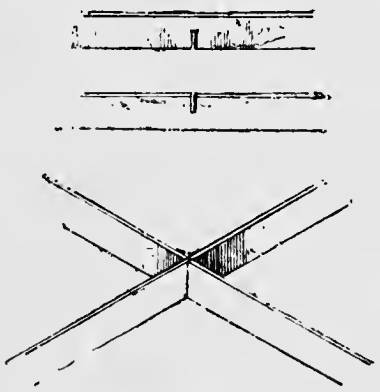


Fig. 28.

A curious effect may also be produced by drilling holes at intervals in a strip, say one-third of an inch, or less, apart, and passing through the holes, in and out, brass wire. Rivet or clamp the wire at the first and last holes. Small round-headed brass nails, here and there, riveted on holes, give a varied and brilliant appearance to very simple work or patterns.

It may be here said once for all, that any curve or turn desired may be given to any strip of flexible iron, brass, or tin, by holding it firmly, just at the end, with the long-nosed flat pincers or pliers, and then bending it into shape with the round, or pipe plier. This is so readily learned by a little practice, even by children, that any detailed description of the method of holding or using the pliers is really unnecessary, and would perhaps rather tend to confuse the beginner and convey the impression that the work is more difficult than it is in reality. But as it is in doing this well that the whole mystery and difficulty of the art consists, and as everybody can certainly learn it by perseverance, I lay great stress on the importance

of mastering it, before proceeding to other kinds of work. For when this is learned all is learned.

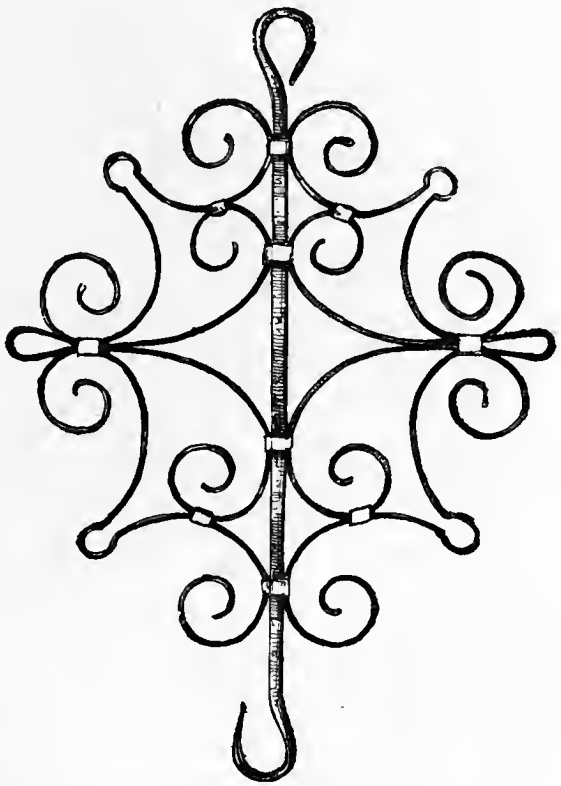


Fig. 29. LAMP HOOK.
(Hooks of this kind can be bought in Florence for 3*d*.)

LESSON III.

THE second stage of bent iron-work is to apply or fasten the strips in ornamental form to *frames*. These are iron rods of different thickness, varying it may be from the tenth or eighth of an inch in diameter, to half an inch. As they are more difficult to manage than the strip work, many ladies buy them ready made, or have them made, which is a very easy matter for any blacksmith, nor does such work honestly cost much. But with an anvil and a small fire, or even, for lightest work, a gaslight, any lady can make any frame which she may require with a very little practice. What is beyond ordinary strength must of course be left to a smith, but a vast amount of very beautiful work can be effected even by children.

To make a frame, first buy a sufficiently long piece of nail rod, or square iron rod, rather less in diameter than a common lead pencil or penholder. The smaller it is the easier will it be to manipulate, and the pupil can rapidly advance to larger sizes and heavier work. This rod or mere thick wire may for a great deal of work also be round. Bend this, by heating the places where it is to be turned, into a square. Very flexible iron can be bent without heating, by means of carefully curving and hammering. When this is done, drill two holes through the ends which meet, and rivet them. Then you will have a square frame, Fig. 30.

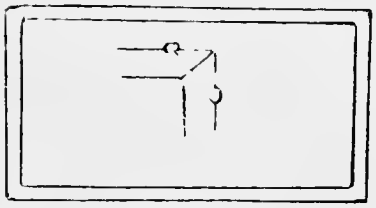


Fig. 30.

As a glass will probably be placed in this, there are two ways

to effect it. One is to take a strip of flexible iron, and bend it into a V shape, or at a right angle all its length, Fig. 31. Any tinsmith will do this for you, by means of a little machine made for the purpose, one of which you can buy. But this turning the edge is also easily effected by putting one half the strip into the vice, and hammering the other half (of course lengthways) to a right angle. Make four of these V strips, corresponding in length to the inside of your frame, or even in short bits. Drill holes and rivet them in. This will hold the glass.

Fig. 31.

Another way is to take a strip of iron, or narrow ribbon, and bend it in an undulating or wave-pattern, Fig. 32. Unless the strip be of very soft iron it had better be heated, but in most cases careful hammering and wielding the pliers will suffice. This can be fastened to the frame either by riveting or binding with little strips or clamps, hammered round frame and border.

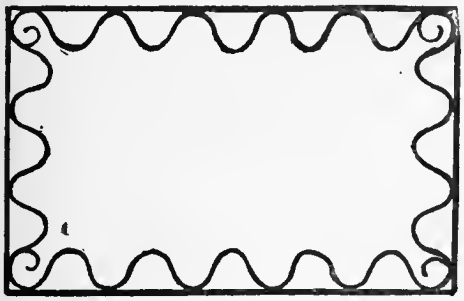


Fig. 32.

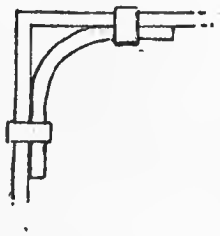


Fig. 33.

The easiest but least ornamental method is simply to drill eight holes into the inside of the frame and to drive into them iron or wooden pegs, leaving enough projecting to hold the glass. Again, you can bend a narrow strip, not quite so thick as the frame (that is, leaving the space of the thickness of the glass), and curve the corners, fastening the whole with rivets or clamps, as shown in Fig. 33, for corners alone.

Having made the frame and secured the glass, the next step is to make decorations of strips, as taught in Lesson I., and to apply or fasten them on.

As strip iron-work is extremely cheap, it would be well for all who can afford it, especially teachers of schools, to purchase, and keep for models, a few specimens of it. With these, or with designs or photographs, and the instruction already given, all the commoner kinds of frame and strip-work can be easily executed. And I here lay stress on the fact that it should be practised until the pupil is quite perfect in it, before proceeding to more advanced work.

It is not more difficult after practice in making S's and C's to form letters which may be placed as initials in a centre, or

Fig. 34.

Fig. 35.

made into inscriptions to fill borders. These are most striking when made of strips of brass, copper, or red metal, to contrast with the iron, Fig. 34.

When the work is done it may be blacked with "Day and Martin," or painted black, or worked with bronze powder and acid, or japanned in the usual way, or most effectively finished by heating it and dipping it into oil. Drop-black, ground in turpentine, with an addition of one-eighth bulk of japanner's gold size to bind it, is also recommended.

BORDERS.—Borders generally consist of ornaments regularly repeated on one, or between two frame rods, Fig. 35. Wherever a rectangular space is to be filled, a border adds greatly to the appearance, and for this reason is particularly applicable as a

frame for a picture or mirror. Borders may be filled with inscriptions in letters, as well as with ornaments.

Borders, or rather plain bands of brass, may be slipped over cylindrical cups or square objects of iron, or tin, or copper: or copper bands on other metals. They may be riveted on with boss-headed nails. Such bands may be ornamented in repoussé, by engraving, or with acids.

Any tinsmith will make to order cylindrical tankards, cups, or boxes, etc., and solder them. These you can ornament in many ways, with strip metal or in other fashion, for there is really no ordinary object of the kind which may not be made attractive by the exercise of a little ingenuity.

Another writer on the subject has said wisely and well, that the excellence of bent iron-work depends on the correctness of the curves, the firmness of the bindings, and the gracefulness of the forms. I am particularly struck with this, as I here write in Florence, having before me not only a very large number of exquisite and elaborate specimens of such work, but also a large collection of photographs, in which there is displayed such luxuriance and variety of invention and of ornament, such grace of fresh and startling curves, that one is astonished to find so much art and beauty in such cheap material.

I would add to what is here stated, that after having examined a vast amount of such work here in Italy, where it originated, and with beautiful and very elaborate specimens of it before me, I have found nothing in it all which is not clearly described in the instructions given in this book.

I have not given minutely detailed directions as to how every twist shall be made, and every rivet and clamp put into every piece of work depicted. Such directions, even when accompanied with illustrations, are very difficult even for a master of arts to understand, although they have a very practical appearance in type. But if the pupil has perfectly practised and mastered—

as I have certainly clearly explained—how to bend, twist, ply, recurb and smooth iron strip, all that he can possibly need is to have before his eyes the design, and to imitate it. The best way to teach this, or any other art, is to carefully teach the pupil to observe and *think* how anything should be done.

FIGURE WORK IN STRIP OR RIBBON.

ITALIAN bent iron-work is limited as regards ornament chiefly to circles, S curves, and spirals, nor does it often go beyond a

Fig. 36. SIMPLE PLANT FORMS FOR FIGURE WORK.

repetition of the simplest geometrical forms, or leaves, in which it is closely followed by all English writers and teachers of the art. This is quite needless, for with a little care, any simple

figure, such as a bird, an animal, or ornamental spray or crocket, may be made even without a fret-sawed mould, by bending with the round pliers and pinching. However elegant and elaborate the best Italian work may be, it soon produces a sense of wearisome monotony when seen in quantities.

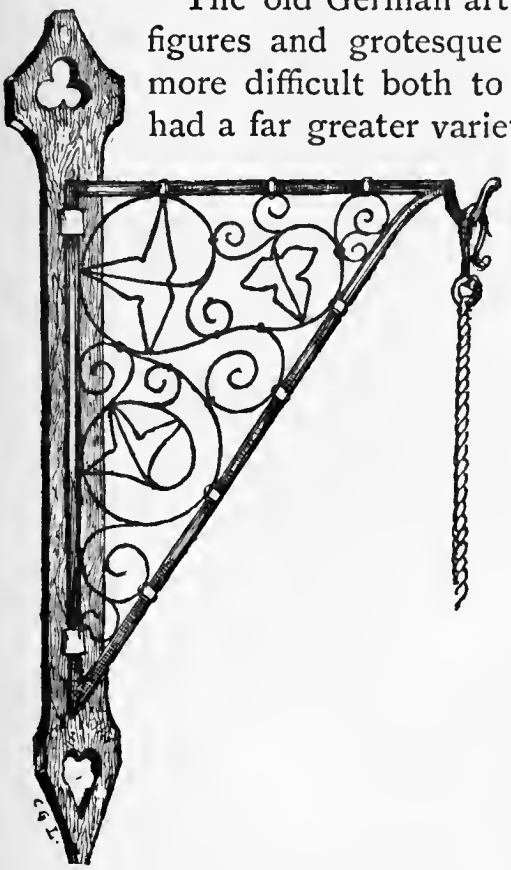


Fig. 37. HINGED BRACKET.

The old German art of the same kind abounded in figures and grotesque forms of all kinds, which were more difficult both to design and execute, yet which had a far greater variety and interest than the former. And there are many figures which, as the reader may see by the designs, are almost as easy as common curves, and which even a child could form, Fig. 36.

The easiest way to do this is to draw the figure, be it of a bird or animal or a face, etc., on paper, and fret-saw it out of a thin piece of wood. Then take the strip, which should be preferably of *thick* sheet iron, because the thicker it is, the more firmly will it retain its form. Bend this to the wooden mould or form, till you have got the outline exact. In most cases the strip should be drilled here and there and fastened to the wood with tacks, to keep it in form. Then make up or fill the surrounding space with curves, and when all is riveted the central figure will be firmly in place. Then remove the wood.

It is needless to say that the simplest outline figures are best

suited to this work, not only because they are the easiest, but because they are the most effective. It is not advisable for the most skilful and ingenious artists to attempt to make "pictures" in metal, but simple forms combined with Italian curve-work are, when skilfully chosen, the most attractive phase of the art.

The effect is improved when the figure is of brass, German silver, or copper, and the surroundings of iron. Gothic ornament, such as abounds on churches, will be found extremely rich in suggestions for such figure work in iron, because, not-

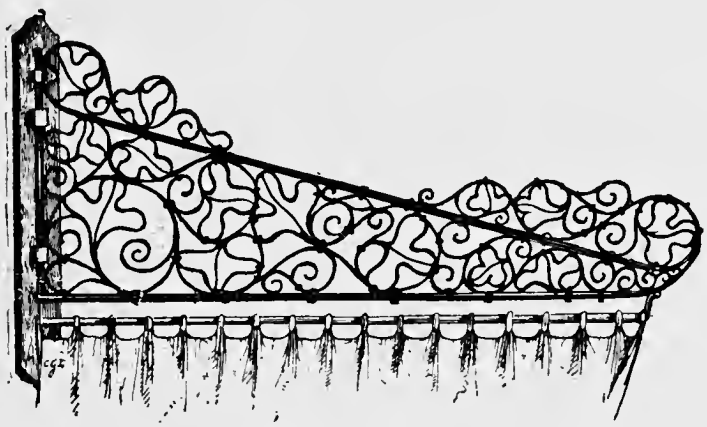


Fig. 38. Bracket for Door Curtain.

withstanding its complexity, the *outlines* are almost invariably very simple.

To make this quite clear I would say that any pattern whatever in a Gothic glass window, *enclosing the glass*, can be executed in bent metal or strip-work, as a matter of course, because such outlining was very often strip-work, when not a leaden frame, which was even harder to make into varied forms (see Fig. 45, p. 32), And with patience and practice the pupil will find it just as easy to mould strips into leaves, human figures, or animals, as to bend wire to his will. The process is analogous to preparing the walls or compartments for cloisonné work, in

which the most delicate and minute patterns are made by arranging strips of metal (see Figs. 39-42).

Fig. 39. MIRROR FRAME.

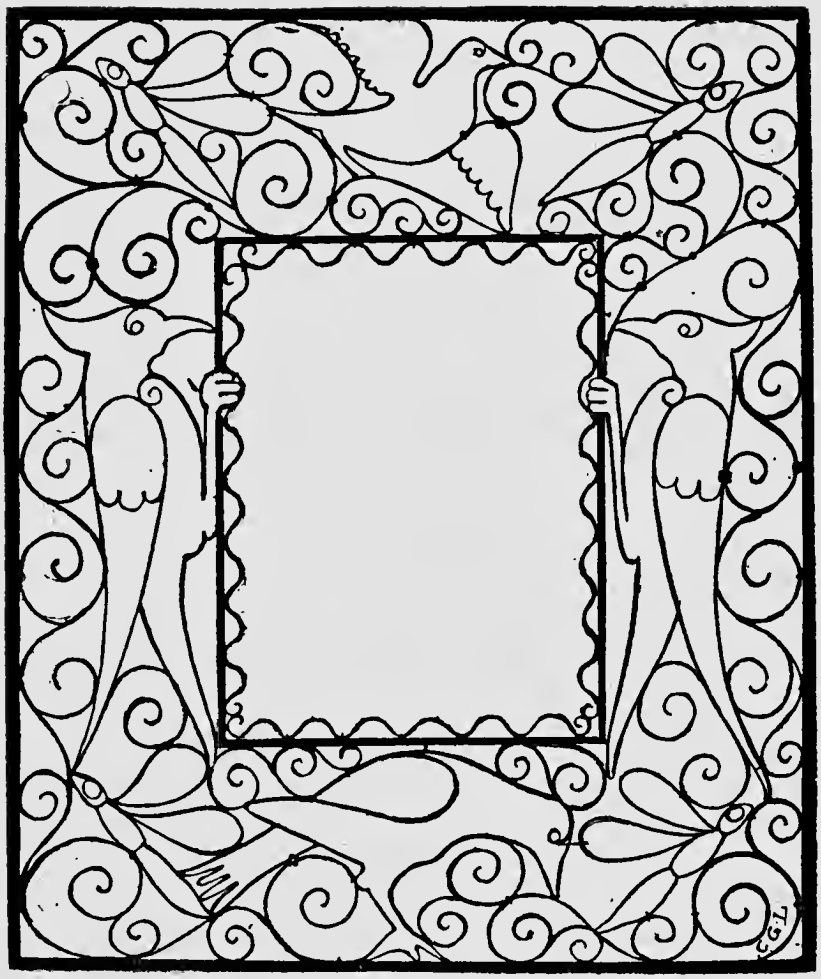


Fig. 40. PHOTOGRAPH FRAME.

Fig 41. Circular Panel or Frame (without the Centre).

Fig. 42. Book Rest and Support.

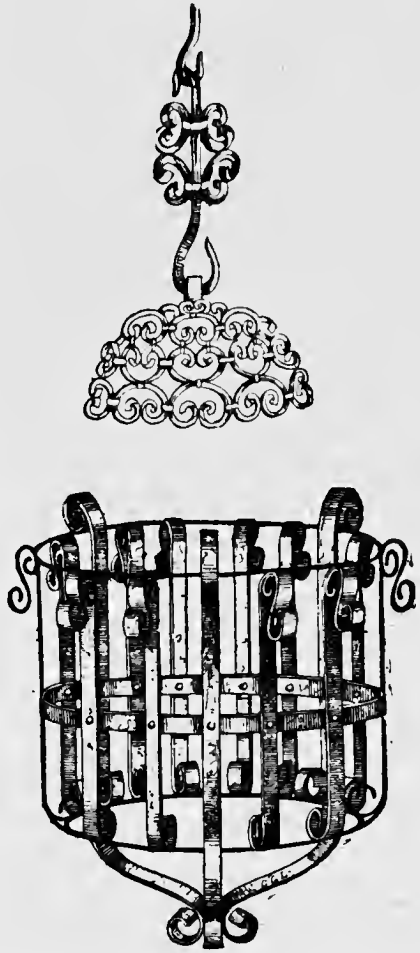
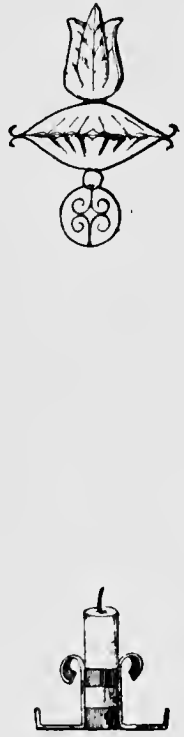


Fig. 43. Holder for Oil Lamp.

Pattern for three Chains.



Sockets for Candle.

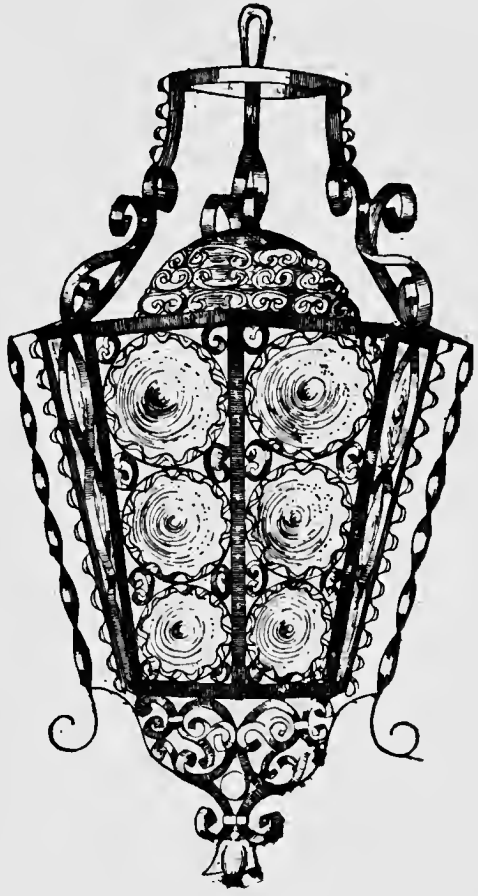


Fig. 44. Six-sided Hall Lantern.

OF SETTING GLASS, MOTHER-OF-PEARL, ETC.

The ordinary Venetian work seldom goes beyond setting disks or circles of coloured glass or square panes in lanterns, but as soft strips can be easily bent to any common curve or geometrical form, such as an oval or ellipse, circle, diamond, etc., it will be seen that there is a vast field for beautiful ornament of this kind, that is to say, for mosaic, in which the "stones" or "cubes" are to be divided by strip iron.

Coloured glass is specially adapted for lanterns. It is easily enough shaped with the diamond or a shilling American steel glass cutter. It is also possible to trim flat glass into good enough shape for such work by taking a strong pair of scissors and cutting the glass *quite under water.* With a little practice one can attain to great skill in this. If necessary, the glass can be made neat and smooth on the edges by grinding it on a common grindstone with water. It can also be worked with a sharp file, which cuts better if dipped now and then in spirits of turpentine.

Frames made in compartments may be filled in with pieces of mother-of-pearl, with a very beautiful result; with bone, which can be bought sawed into thin tablets, and which is easily dyed of any colour; with variegated wood, all of which can be fret-sawed to any shape; and, finally, with pieces of porcelain or crockery, made from waste or broken plates, by breaking into shape, filing, and grinding. We can also employ fireclay, moulded in the strip-pattern. These pieces, when dry, can be easily fired even at home, but it may be cheaply done at any pottery; then paint them with porcelain colours, and have them fired again. Another very beautiful and brilliant effect may be obtained by pounding coloured glass in a mortar—some may be pulverized fine, but that which is coarsely powdered is the most brilliant—

fill the compartments with Portland cement and colour the surface with the glass powder.

The reader must remember, that to produce these compartments the strips must generally *cross* one another in the manner which has been already described (page 18). In this manner we can very easily form a panel of diamonds or squares, and in fact execute in strip iron any outline design whatever.

Fig. 45. DESIGN OF GLASS PANEL.

SOLDERING.

In the ordinary strip-work nothing is used to connect the bands except riveting and clamps. But to unite portions of frames there must often be if not positive welding at least an union of metal to metal by means of soldering or "soddering," which is a kind of welding, as it joins iron by heating and using a flux or another substance which serves to soften it.

Soldering can be learned by any boy with great ease from any smith, or even from the first tinker—the latter class having probably by far the most pupils, as there are few village boys who have not watched them at work. And as it is to the last degree improbable that any of the readers of this book will live where they cannot see soldering,—for I have heard of a gypsy tinker being found at work in a remote place by the Great Wall of China,—I might dismiss this subject by advising them to go to the nearest worker in metal of any kind.

Solder (Latin *solidare*, to make solid), is a compound of extremely fusible metal, yet which *sets* hard, and which, used in connection with certain other substances, as for instance the spirits of salts and zinc or resin, will, with a very moderate heat, at once unite iron with iron. There are different kinds of solder for different metals, as, for instance, silver solder. Spelter is another combination of metals, in different proportions, used for the same purpose but in a different way. For ordinary soldering, file the parts to be united quite clean, sprinkle them with powdered resin, and put on this a small piece or pieces of solder. Having a spirit lamp at hand, turn the blaze on the resin, which will burn and melt the solder, which will unite the iron.

For larger work use spirits of salts to rub the surface, and melt the solder with a hot iron or on a brazier. The spirits of salts here serves to draw or flux the solder. Where broad surfaces

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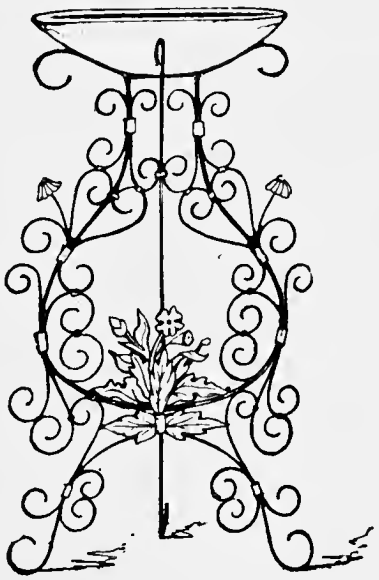
are thus treated and are brought together by clamping or pressure, the process is known as binding or sweating on.

Brazing is another variety of the same work. It requires greater heat, that is, a fire generally with bellows, or a blow-pipe. For this spelter is employed, being first powdered. This is mixed with borax and water, and passed between the portions which are to be united. When the heat is sufficiently high the spelter and borax will fuse and unite the iron. This is rougher work than the former, and is such as is generally practised by smiths.



FLAT SHEET METAL WORK.

SHEARING, CHISELLING, FRET-SAWING, AND PRESSING.

DISTINCT from, but closely allied with strip metal work, is sheet metal work. This is very beautiful and also easy work when soft and thin sheet metal is used. It entered largely into old German designs, especially in Nuremberg work. When sheet iron or brass is very thin it may be cut with strong scissors almost as easily as cardboard. When there are small openings into which the scissors will not pass, lay the sheet on the anvil and cut them out with a narrow cold chisel, using a hammer; or else, opening a small hole with a drill or nail, use a file. When the sheet is too thick for the scissors, use shears; and when these fail, then you can either cut out the whole pattern with the cold chisel and hammer, or else, taking a fret-saw, treat it like a sheet of wood. Brass or soft iron from *one-eighth of an inch* in thickness to half an inch

can be thus sawed into patterns, but I assume that in all the work of the pupil he will rarely have occasion for sheet metal of

Fig. 46. SMALL PANEL. CUT METAL.

Fig. 47. FRET-SAWED SHEET METAL.

such thickness. When the cutting out is completed, the whole may be finished with a file. Figs. 46, 47.

Thin sheet metal can be easily cut with a common fret-saw, such as is used for wood, but for thicker metal work a saw with a thinner blade and narrower frame is employed; these are cheap, with one frame a dozen saws are generally supplied, the whole may be had at all prices, from a shilling to a pound. Fig. 48. Of course, a hole is first made in the metal with a drill or round file, the saw passed through it, then fastened, and the cutting is executed by working the saw up and

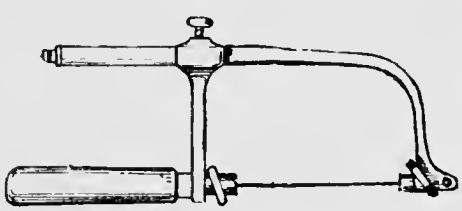


Fig. 48. FRET-SAW.

down.[1] Whatever can be cut in wood or paper can be done in sheet metal, even to the most incredible fineness.

Figures of men or of animals, heads in profile, birds, butterflies, flowers, grotesques, arabesques, or, in short, anything *in outline* cut from sheet metal can be freely combined with the strip, band, or ribbon work, already described.

One way to adapt these figures to the strip or ribbon work—that is, to attach them to it—is to drill holes in the strip, leave a projecting bit on the edge of the figure, pass the projection

A Fig. 49. B

through the hole, and clinch or rivet it with a blow on the other side, flattening it sideways. Fig. 49 A.

In other cases a leaf may be riveted in the ordinary way to the end of a strip which has been previously heated and turned round; or a turn may be made in the neck of the leaf, etc., which is then riveted to the strip. Fig. 49 B.

The surface of sheet metal work may be decorated in different

[1] Arturo Fumel, Via San Paolo, No. 7, Milan, publishes a very extensive and cheap album of patterns for this work in wood, giving nearly 300 for threepence.

ways: (1) by *repoussé*, or working on it with hammer and tracer and stamps, which will be described in another section of this book; (2) by *engraving by hand*, which may be sufficiently well learned for mere line work in a few days; only two or three gravers of hard steel are needed for this (Fig. 50). The lines are cut by projecting the point and pushing it forward, not by scratching towards the operator. The art is not difficult to acquire, and when learned, is applicable to wood-engraving, ornamenting the surface of metals, shells, and other substances; (3) by *etching, or engraving with acid.* To effect this the iron or other metal is covered with a thin coating of wax, care being taken to make a little wall of wax all round the work—or else with varnish—then with a "point," or a pin or needle in a holder, scratch the design in the coating so as to expose the metal; this done, pour on it a mixture of about one-third nitric or sulphuric acid to two-thirds of water, and with a feather remove the little rows of bubbles which will at once begin to form. After ten minutes, pour out the acid and water into a cup, dip the plate into water before handling it, then remove the wax, or wash away the varnish with turpentine, and you will find the design eaten into the metal; the wax may be quite taken away by heating it. If there are any imperfections in the etching renew the process.

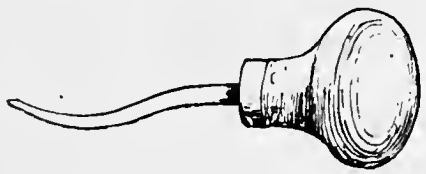


Fig. 50. GRAVER.

When the sheet of iron is tolerably thick it may be beautifully ornamented as follows. Cut with the graver grooved lines, deep enough to receive gold or silver, brass, German silver, or copper wire, lay the wire in the groove and hammer it in. This will generally hold fast, but the process to be perfect requires that the metal be heated and fluxed with borax.

Etching or engraving by hand, or with acid, may also be gilded

either with gold-leaf and size, or else with gold (or bronze) powder and gum-water; this latter may be protected with a coat of re-

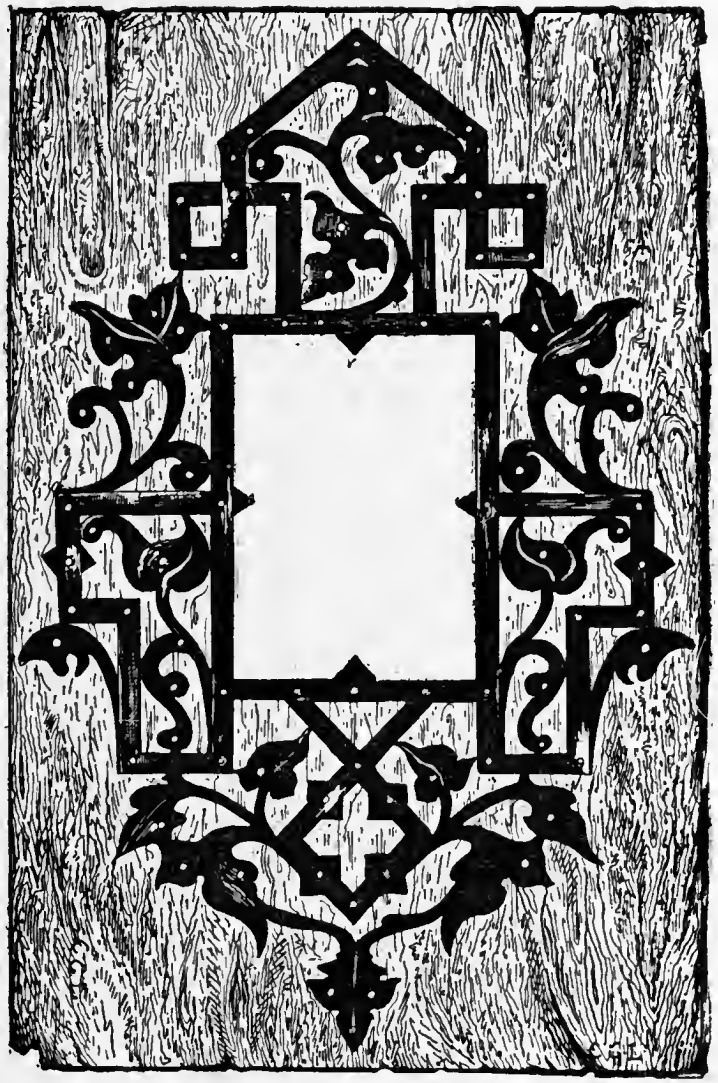


Fig. 51. INLAID METAL WORK.

touching varnish. Even a very little gilding, tastefully applied, on black iron work greatly improves its appearance. We can, with a file, or better still with a graver, run or cut a line along the

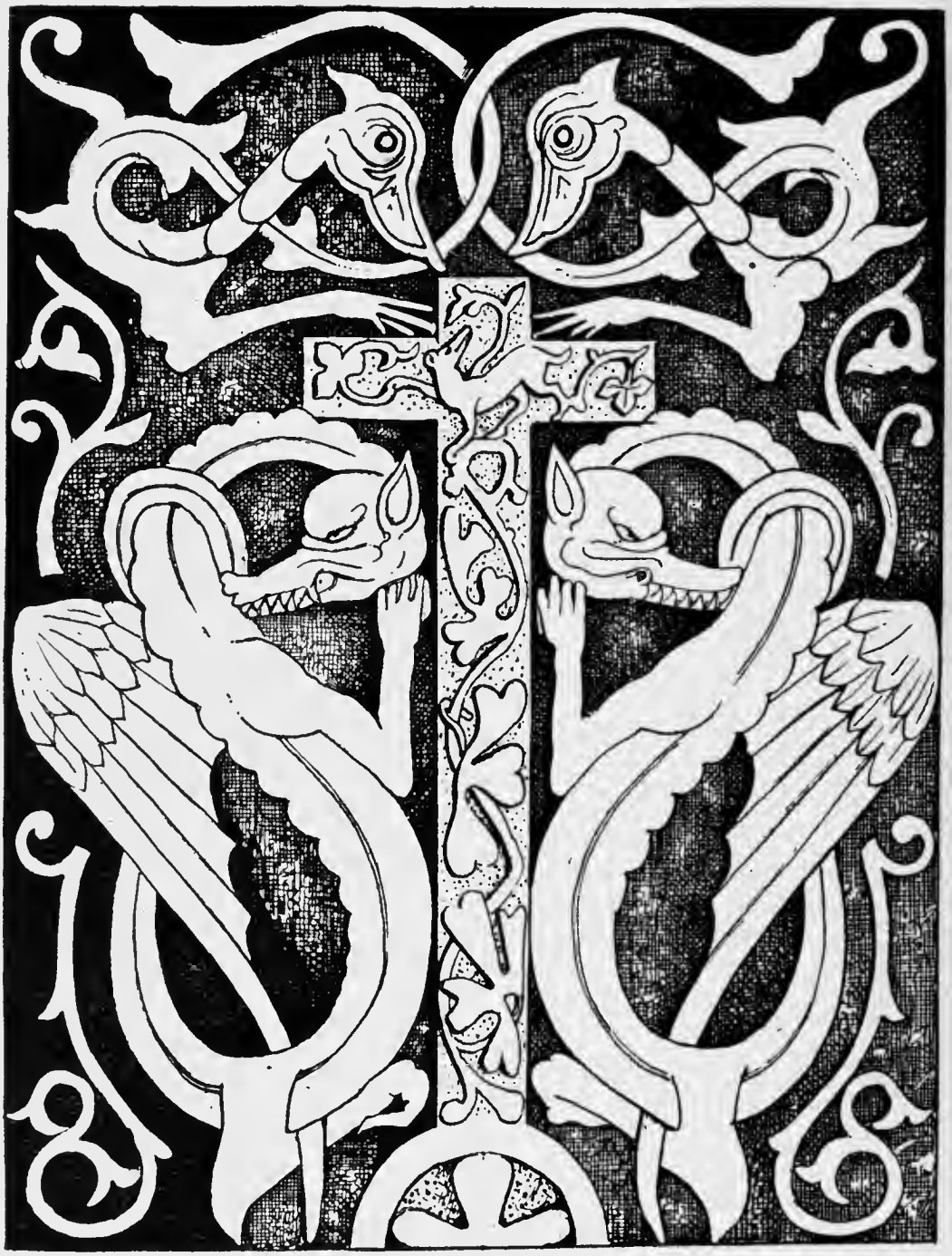


Fig. 52. Book Cover. Fret-sawed Metal on a Thin Panel.

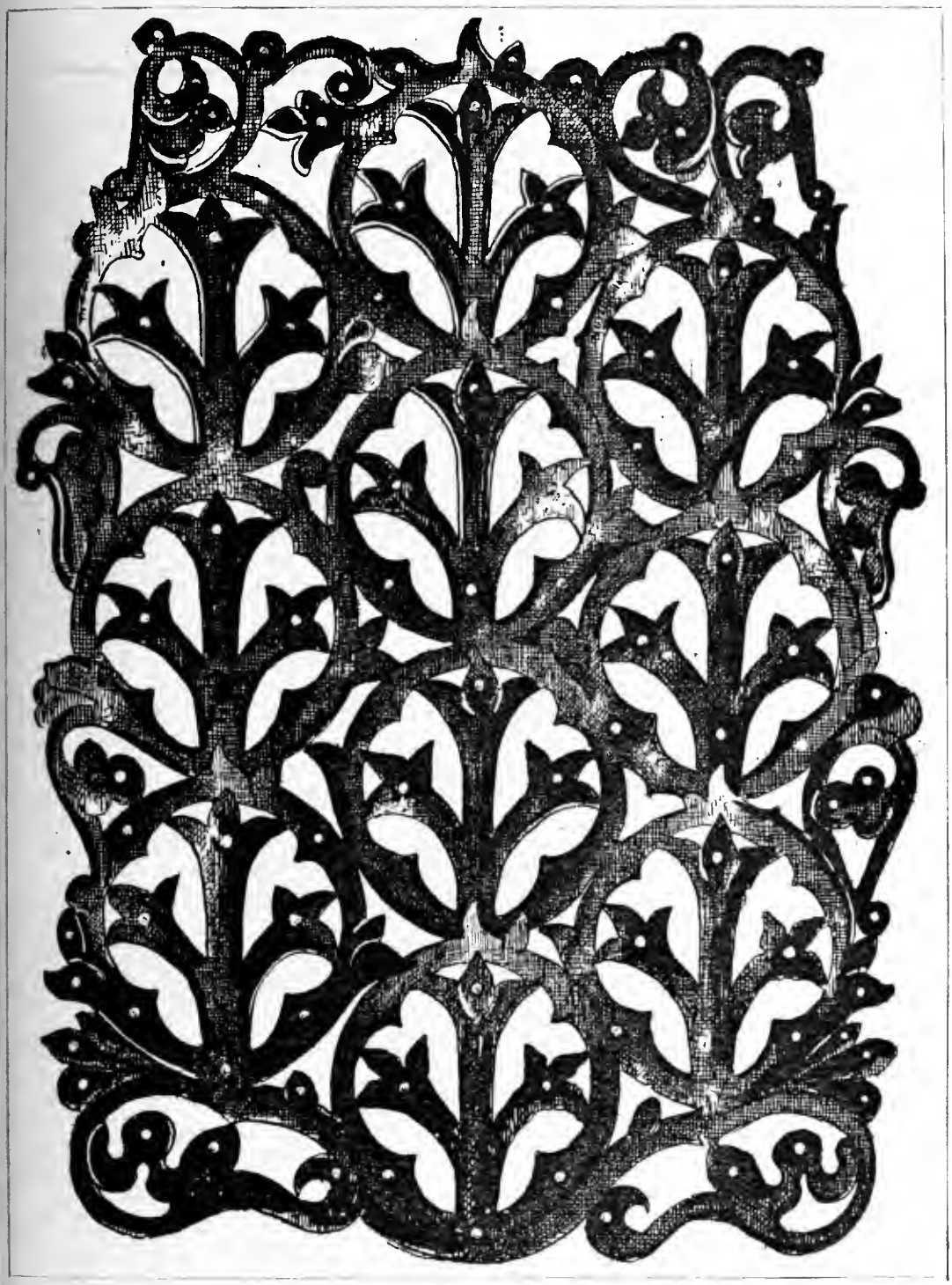


Fig. 53. Old Swiss Sawed Iron Work. (1537.)

centre of a strip of iron; this is made easy by slipping over the strip a sliding flat ring, in which there is a hole to receive the cutter, Fig. 54. We then introduce the point of the cutter or graver, and,

Fig. 54.

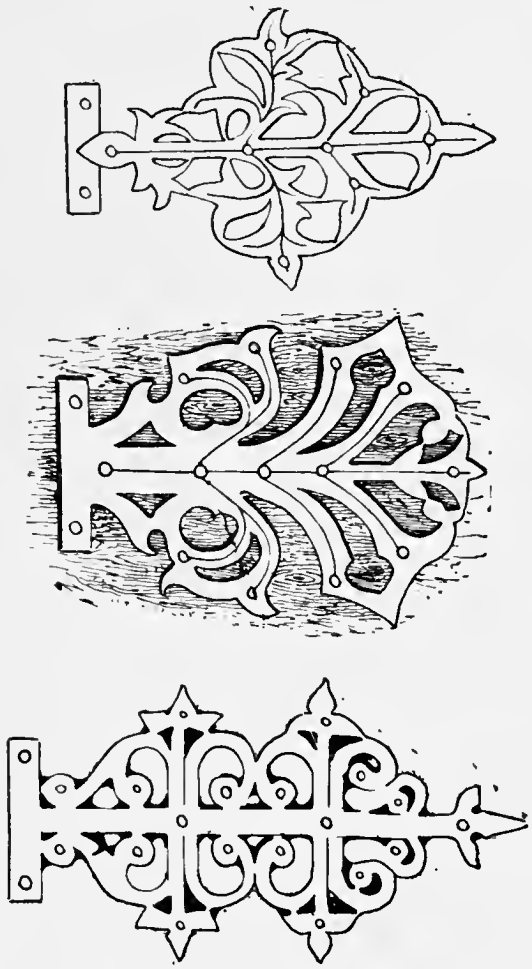


Fig. 55. HINGE-PLATES.

A

B

Fig. 56. BRASS SCUTCHEONS.

bearing on, push it along; fill the groove thus cut with gilding or gold-powder paint.

Beautiful effects may be produced in sheet metal by cutting out a pattern and then placing a larger sheet of another metal

behind it ; then rivet or tack the two on the ground, taking care that no ends turn up. This is applicable to picture frames, cabinet doors, or any plane wall surfaces.

Very beautiful inlaid sheet metal work is made as follows.

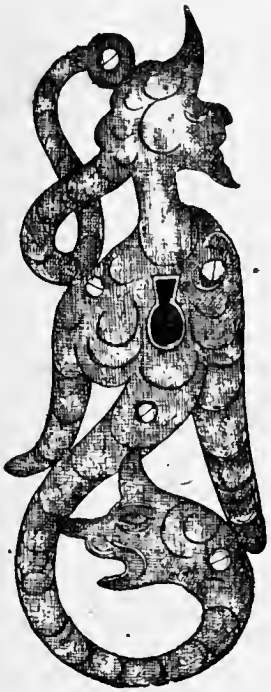


Fig. 57. NUREMBERG WORK, 15TH CENTURY. BASLE MUSEUM.

Fig. 58.

Cut out the pattern from thin metal, and lay it on a panel of wood, which should of course be hard and well seasoned. The metal may then be thoroughly pressed into the wood by means of any kind of screw press, or even with a roller. When thoroughly imbedded, take it out, coat the back with the

strongest Turkish or mastic cement, and if the latter be well made it will hold the metal to the wood; should it "spring" in any places it may be riveted. Another way to imbed the metal is to lay it on the wood, draw the outline with a sharp needle, cut the wood out with great care, cement or rivet the work, and rub the cement well into all cavities or edge cracks.

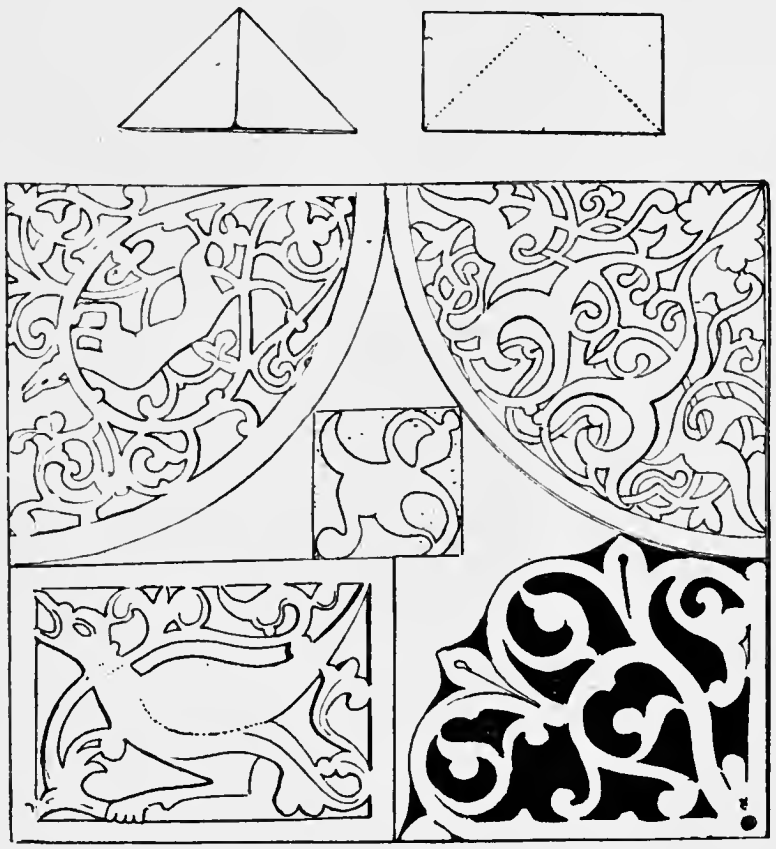


Fig. 59. CORNERS FOR BOOKS.

A very beautiful decoration for any box or chest or door is made by cutting out either true or false hinges from thin sheet metal and screwing them on. A false hinge is only the ornament applied to the edge of the hinge on which the lid turns. See Fig. 55. The same patterns may be used for book clasps.

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A *scutcheon* is a keyhole plate used to protect the edges of the keyhole. Figs. 56-58. In both Nuremberg and Italian work these scutcheons were often very broad, as were the hinges, and sometimes very grotesque. A very effective enrichment is obtained by having two or more pierced plates laid one over the other and riveted together as a whole. In this case the lower plate will be pierced so as to leave a little margin all round the pattern above it (see Fig. 56 B), or if the top plate is pierced, leaving rather large openings, a different scroll, diaper or trellis pattern of smaller scale, may be placed underneath it. In many old examples this "double tracery" work is underlaid with velvet, leather, or cloth, not showing at the outside edges. The most ordinary wooden panel, door or shutter may be made beautiful or attractive, at very little expense, by means of such adornment. Flat strip work may be thus applied. Slighter work of the same kind may be used for making shields to protect the corners of books. Fig. 59.

STENCIL CUTTING, which is a special form of flat sheet metal work will be found described later in the volume.

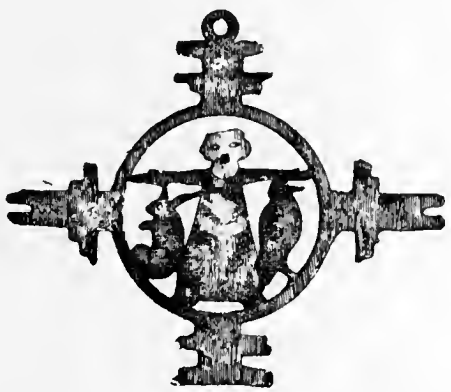
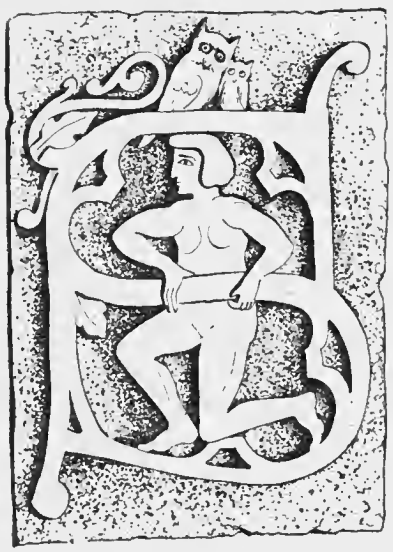


Fig. 60. CROSS OF SAWED METAL.

MOULDED SHEET METAL WORK.



SHEET brass and copper, especially red metal, and also thin *malleable* iron when it can be obtained, can all be shaped as easily as damp leather, in fact, more easily, because they retain any form or indentation more firmly. The processes for making leaves and flowers are indeed essentially the same with those of the old-fashioned leather or wax work, so that anybody who is familiar with one, could immediately work successfully in the other. For thick and ordinary sheet iron, which is harder and more brittle, smithing, or heating and shaping by hammering on the anvil is necessary; of this I do not propose to write, but would say that to those who have thoroughly mastered all the lessons here given—which, it must be admitted, are extremely easy even for children, if gradually and carefully learned—ordinary forging or hammering heated metal will be found even easier, and there is also in it a certain fascination or pleasure which is indescribable. I was very much astonished when I first learned how easy it is to forge a knife, dagger, or sword, especially when the pupil has

some previous knowledge of design, modelling, or wood-carving.

Therefore I earnestly urge the pupil, when it is possible, to practise, even if it be but for a short time, making leaves and flowers of sheet wax, paper, or damped leather, because this very easy work is an admirable preparation for sheet metal, especially for children, who find no difficulty in learning the former, and in going from it to the latter, but who find the metal at first difficult.

To make a leaf in thin sheet metal, after having moulded one in wax or leather, requires no knowledge or practice beyond being told to hold one end with the flat pliers, and give it shape with the round-nosed or pipe pincers. If the stem or vine be a wire, then let the stalk terminate in a strip which may be wound around the wire. To prevent it slipping, flatten the wire slightly in one place, and hammer the wrapper to it, or else rivet through the flattening. Fig. 62, *p*, *q*, *r*, *t*, etc.

A piece of soft sheet metal may be easily moulded into any form of leaf, scooped or goffered, fluted or waved, by means of the pliers, round-nosed or flat, the ball-punch, or the hammer. This work may be performed on the anvil, on a piece of soft pine plank, or on a bed of the cement used in *repoussé*, according to the curve required. It is *quite* useless to describe in detail how every kind of depression, or hollow, or boss

Fig. 61. Border or Frame.

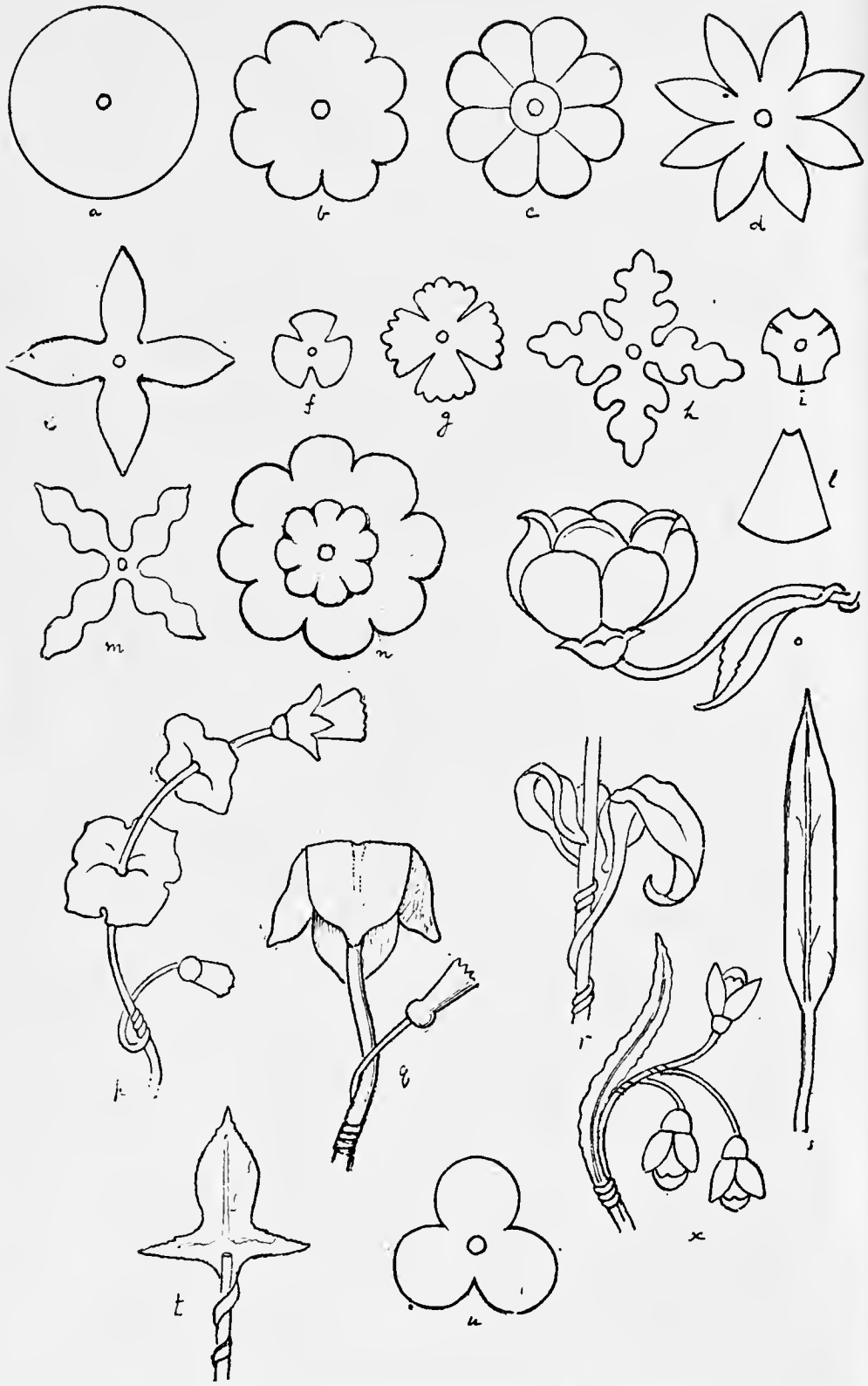


Fig. 62. PATTERNS FOR METAL FLOWERS, ETC.

is to be made, since all such detailed descriptions are more confusing to youthful beginners than helpful, and even young children require no instruction to *imitate* the bend of a leaf in wax or paper. I have taught classes in such arts for years, and have always found that if the pupils will only begin with very easy imitations of models or designs, and, taking an interest and working industriously, *thoroughly* master the rudiments, they always find their way onwards, step by step. All that they require is to know exactly what they are expected to do, and to see the objects, models, or pictures, of what they are to make, and if these are not beyond their power or intelligence, they *will* make them, and, while so doing, learn something for more advanced work. This is well shown in this modelling of leaves and in bending metal, in which any intelligent pupil—the tools, metal, and model being given—is sure to find his way to do good work. This is the only way to make a good artizan or artist, that is, to make the learner *think* and stimulate his inventive power. He is the best teacher who does this.

The mid-rib or lines on the leaf are very easily indicated with a tracer, like a screw-driver, the use and command of which can be acquired in an hour (*vide* "Repoussé," p. 61). The pupil should, however, take great pains to learn to execute all these "inside lines" very carefully. They require a rather sharp tracer, and must be light: in many cases it is best to make them with a graver, or sharp cutting tool.

A rose is made by forming what may be described as two or three circles, of different sizes, with scalloped edges. Or, as described in my "Leather Work," p. 61:—"The processes of cutting out leaves to make flowers are the same as those followed in making them from paper. Thus, to form a rose we cut out a scalloped circle, and then a smaller one, which is placed on the first. The outer, or green leaves of the calyx, are in like manner cut from a third disc [or round piece (Fig. 62 *a*, *b*, *c*, *d*, *e*)]." A wire is then

taken, to one end of which is fastened a circle, or button, or small screw by riveting, and the other end is then passed through the holes in the centres of the scalloped circles.

It is to be understood that the scalloped ends which represent leaves are previously hammered into a saucer-like shape, and otherwise shaped out. If this be done first in sheet wax, or even in thin cardboard, damped, or stiff paper, the imitation in metal will be easy. As regards the saucer shape, it may be remarked, that if we take any round piece of sheet metal, thick or thin, be it half-a-crown, or a disk of sheet iron, and gradually tap it on an anvil with a small hammer, it will *form a saucer of itself* if beaten only on one side.

Oak leaves, which admit of great variety of graceful curves, as also the ivy, are beautifully adapted to frames. A stick of hard wood with a round or ball end, or an iron implement, as, for instance, one like a bolt with a round end, or a ball-headed punch, and a tracer, are useful in shaping and making leaves.

There are certain varieties of metallic buttons which can be admirably adapted to metal flower work, to form centres for leaves. Spherical buttons and metal beads, strung together on wire, form ingenious bunches of grapes or berries.

Brass or copper may be easily hammered into a cup like half an egg-shell. Two of these fitted one into the other, and riveted or soldered, make oranges or apples. The riveting is effected by first putting into them a round disk of wood just in the centre, and driving the rivets in from the outside, or they may be soldered together.

It will be found much easier for the pupil to make flowers for himself out of paper or wax, and then imitate them in metal, than to make them at once in metal, even from the most clear and careful directions ; and it is advisable to copy real flowers as much as possible, as this will make an artist sooner than copying the best models.

Sheet metal work is allied to strip work on one hand, and to *repoussé* on the other, but there is an endless variety of objects which can be made in it, either with, or without either. It is well, to begin with, to remember that whatever can be made in paper or cardboard can be imitated in sheet metal. Thus, to make a shallow receptacle which may be adapted to hold a square inkstand or lamp, cut a flat piece of brass or iron into the form indicated in Fig. 63; bend up the ends, turn them round, solder them or rivet them with brass nails, with semi-spherical heads, bend over the handle, and you will have a useful object of

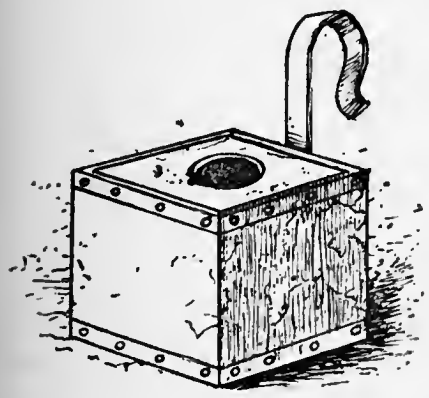


Fig. 63. INKSTAND.

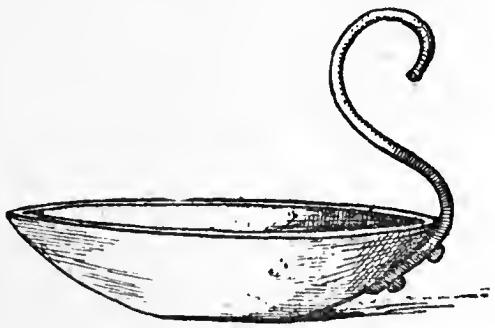


Fig. 64. ASH TRAY.

which the merest beginner can make fifty in a day, that is if the handle be riveted on instead of being cut out.

Another kind of receiver, *patera*, or saucer, or ash tray, is very easily made by taking a piece of sheet metal, square, round, elliptical, or, in fact, of almost any form or size, and hammering it into a shallow or deep scoop, or concave form, or cup, or basin. To this a handle or handles may be riveted, so as to make of it a basket or give it the Roman lamp form, Fig. 64.

A cylinder or cannon-shaped receptacle may be made into a tankard, or converted into the base for a lamp. Take a more or less square piece of sheet metal and roll it into the requisite shape,

and then rivet or solder it firmly. The bottom may be a round piece, with edge turned up, into which the cylinder fits exactly, which may be soldered or riveted on. As before described, this turning the edge is easily effected on the anvil with a hammer, and there is a cheap little machine, used by every tinman, by means of which it can be done accurately, and in a minute. A handle of strip iron or nail rod can be also riveted to the can, Fig. 66.

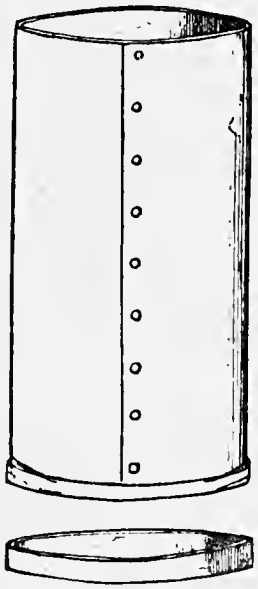


Fig. 65. CYLINDRICAL RECEPTACLE.

Fig. 66. TANKARD.

It may here be observed that old, discoloured, Roman copper, or bronze coins, which can be bought in most curiosity shops for as little as a penny a-piece, and which are in reality often quite worthless to a collector, being as unrecognizable and as ugly as can well be, look very quaint and interesting when set into the centre of a receiver, or around the side of a cylinder or cannon tankard. If the reader will try this he will be quite satisfied with the effect (Fig. 67). To *set* the coins, take a strip

or band of metal large enough to pass round the cylinder and lap over a quarter of an inch. While flat, mark out on it the exact size of the coins. Then within these rings mark out smaller ones, which are to be cut out. An easy way to do this is with a very strong pair of carpenter's compasses with *steeled* points. The difference between the two circles must be exactly broad enough to be "knocked up" and just turned a little over the edge of the coin—practise this first with thin brass or sheet tin—then set the coins, slip the band over the cylinder, and rivet or solder its ends.

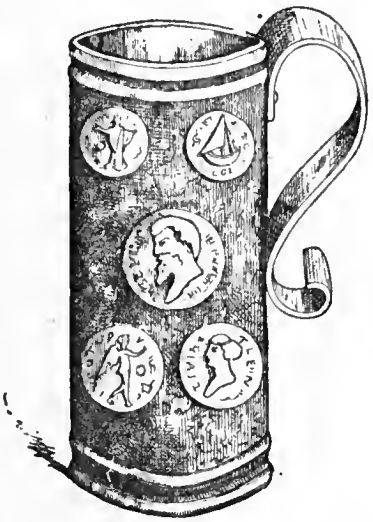


Fig. 67. TANKARD INLAID WITH COINS.

Another way to produce this projection, so as to make a ring to receive and hold the coin, is as follows. Bore in a piece of hard wood a hole a *very little* larger than the coin ; then prepare a wooden cylinder of exactly the diameter of the coin. If we place a piece of thin sheet metal, from which a round piece has been cut, exactly on the hole, put the end of the wooden roller over it, and give it a blow with a hammer, it will of course knock up the edge of the metal into a band which will just hold the coin (Fig. 68). This is the same as if you were to force your finger through a piece of paper ; there would be a hole, and the paper would rise up round it on one side only. This is the better process of the two.

Fig. 68.

A candlestick is made as follows. Form a tube (of the size of a candle) of sheet metal, first make in the end three cuts or splits : after closing the tube, hammer these splits out and they will form three feet on which it rests. Add a riveted

handle if needed. Bands of brass may be put on, if it be of iron, for an ornament.

The most striking kind of sheet metal work is the one least practised. This consists of either *repoussé*, or plain flat sheets *simply outlined*, which are then painted with strong, common oil-paint, or coloured by the processes described further on. Dark-green and black oil-paint take such a firm chemical hold on brass that after a few months they set almost like enamel, and can only be scraped away with great difficulty. They can be cleaned, when hard, like the metal itself. The pattern may be thus blacked, or only the ground, or both alternately (as in Fig. 70). Work of this kind is very beautiful, and extremely effective.

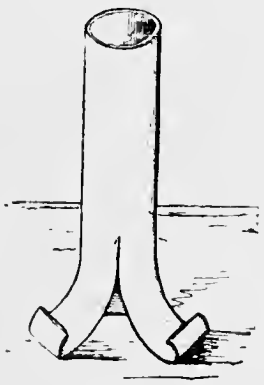


Fig. 69.

To ornament brass work with black bands, or to fill up hammered or *repoussé* hollow places, use a mixture of sulphur and ammonia. It has an unpleasant smell, but sets as hard as enamel, and takes a polish. This mixture of sulphur and ammonia is very black. When used to fill lines or other cavities in silver it has the appearance of what is called *niello*.

To give copper a rich green rust, apply sulphate of copper dissolved in water. Green figures may thus be produced on the burnished copper surface.

Nitric, or sulphuric, or muriatic acids, and even strong vinegar may be employed to rust copper, brass, or iron.

Bronzing may be applied to brass—especially grounds—very often with good effect. There are so many methods of doing this that the student may be most practically recommended to ask for information of those who sell the great variety of colours in metal powders known as bronze. There are also boxes of these colours sold with all necessary utensils and directions. In

"Repoussé Work for Amateurs," by L. L. Haslope, which I commend to all students as containing much practical informa-

Fig. 70. Salver or Plaque of Coloured Brass.
[The pattern may either be outlined or reproduced in *repoussé*.]

tion, the author gives us a hitherto unpublished recipe, the use of a solution of bichloride of platinum in rain water. This is applied to the work with a brush, or the brass is immersed in it till

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a sufficient effect has been produced; it is then washed in water, dried in sawdust, and lacquered. It will pass from yellow to

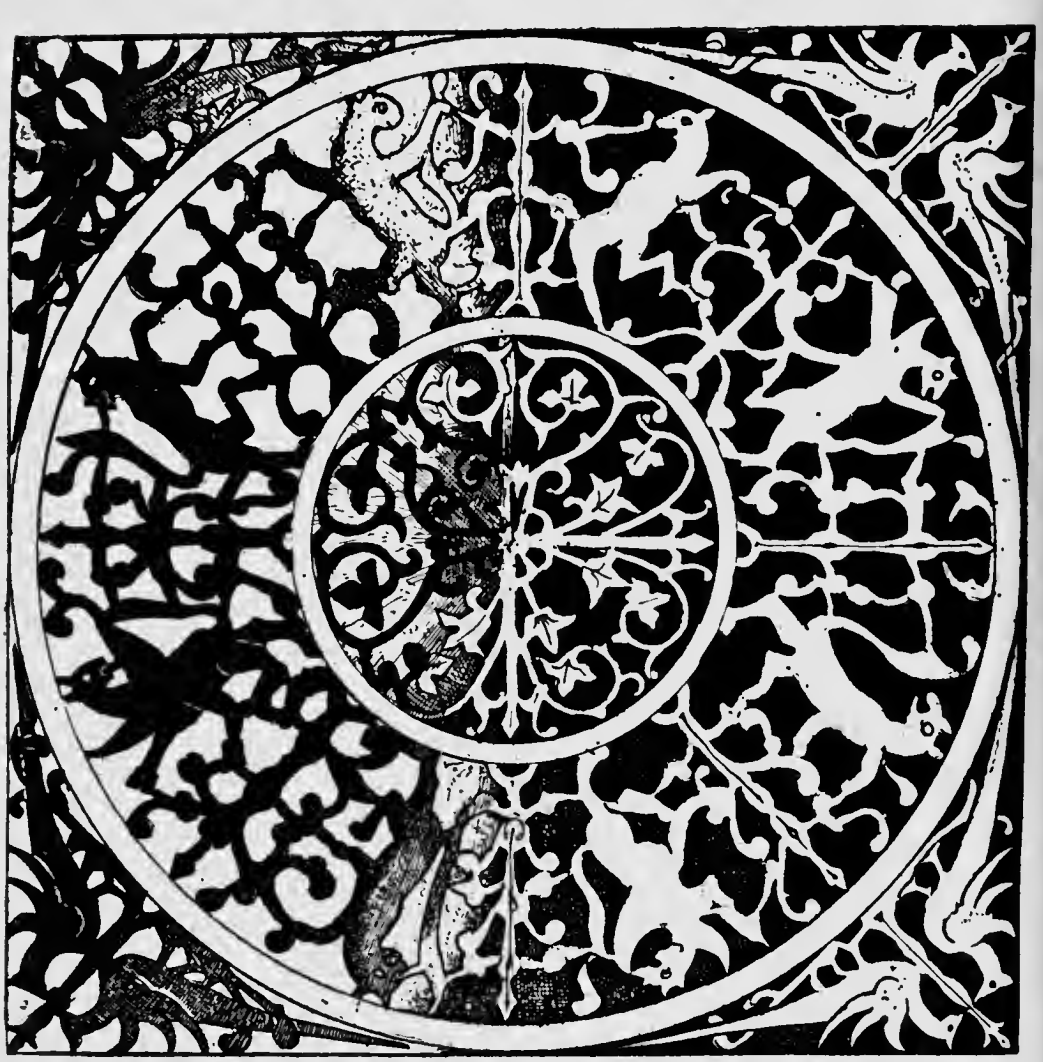


Fig. 71. From the Baptistery, Florence. Pattern outlined on Metal and filled in in Niello.

deep blue if the latter colour is required: wash at once. If left in the solution long enough it will become a fine black, which is

also secured in the same way. This is an expensive recipe. Bronzing is also effected by mixing

Sulphate of iron	2 oz.
White arsenic	1 oz.
Spirits of salts	20 (fluid) oz.

This is applied in the same manner. Care should be used not to inhale the fumes of this mixture.

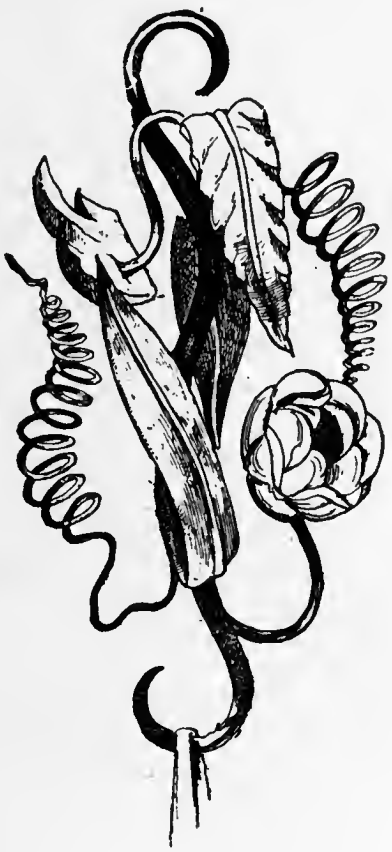


Fig. 72. LAMP HOOK (FLORENTINE).

Repoussé,

OR EMBOSSED SHEET-METAL WORK.

THE art of embossing sheet metal, or making raised designs on it, by beating it with certain tools and a hammer, is called *Repoussé*. Exact imitations of such work can also be made by pressing the sheets into dies with stamps by machinery, but this is not *repoussé* as regards *work*, not having been beaten by hand, although it is in relief.

This embossing is done in two ways: One by beating on the face, in which case the background is driven in with *matts* or stamps and a hammer, and the pattern

remains in relief. The second method is to lay the face on a bed of tough and hard yet somewhat yielding cement, made chiefly of pitch and brick-dust, and beat out or *repousse* (literally push or repulse) the pattern from behind.

The first method, *on wood*, which I was the first to teach in England and America, or to publish, as my works prove, is by far the easiest and least expensive, and most suitable for beginners, serving as an introduction to *repoussé* on pitch, by which latter much bolder and more "artistic" work is produced, though it naturally requires more strength and skill.

Fig. 73. Panel in Flat Relief.

REPOUSSÉ ON WOOD.

TO begin, let the pupil obtain a good panel of *soft* pine wood, let us say of six inches by six, or any other suitable size. It must be free from knots or defects, and about three-quarters of an inch in thickness.

The next thing to lay in a stock of is *material.* Brass is sold in sheets of from six to twelve inches, but may be had of greater width. It is of all thicknesses, from that of note paper up to half an inch. No. 25, or about 10 W.G., or, as we may say, so thick that it can just be cut without great effort with the shears, is suitable for beginners and for most work. Be sure that you get good clean metal, free from red or copper spots, holes, or scales. By obtaining it from someone who makes a business of supplying amateurs and artists, you will get the best.[1]

Copper, red metal, tin, and even thin pewter sheets, are also worked in repoussé.

The tools needed are as follows:

A Chaser's Hammer. An ordinary light shoemaker's hammer

[1] Messrs. Barkentin and Krall, of 291, Regent Street, will supply the necessary material.

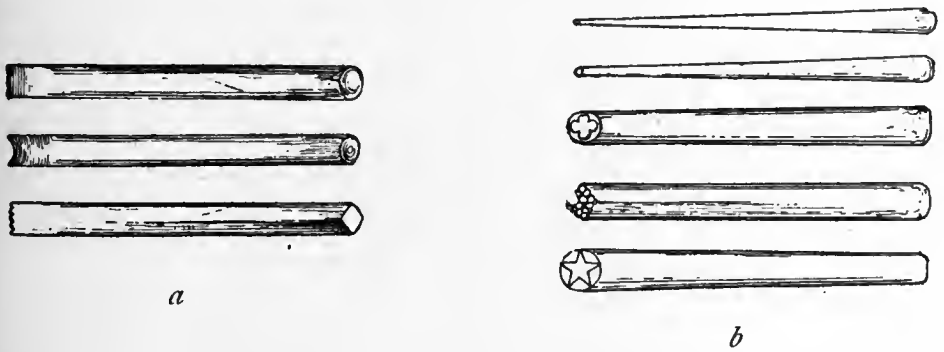
with a sound broad head may be used when the former cannot be obtained. Fig. 74.

Most writers represent the light elastic-handled hammer, as used for the most delicate silver chasing, as *absolutely* necessary even for strong heavy metal, which is by no means the case. In Italy, where very beautiful repoussé is made in abundance, it is usual to beat with a wooden stick. Fig. 75.

Fig. 74.

Tracers. These are tools which look like large headless nails, or pieces of nail rod. The simplest is the straight tracer, which is at the end exactly like a screwdriver. I have sometimes used one of the latter when I had no other tracer. There are also curved tracers, meant to indent all kind of curves, such as the entire side of a leaf at once, a whole small circle, every bend in an S of any size, so that some workmen

Fig. 75. ITALIAN WOODEN BEATER.



a *b*

Fig. 76. TRACERS AND MATTS.

possess them by scores or hundreds. But it may be here borne in mind, once for all, that the first thing to do is to *master* the plain straight tracer in two or three sizes, and learn to make with

it any kind of a line or curve. To do this—which can be effected in a few days, with determined application—is to master the whole art of repoussé in low relief, or on the face. There is another kind of tracer, the edge of which is like an extremely fine saw. This is used for finishing, and produces a neat dotted line. *Vide* Fig. 76*a*.

Matts or Stamps. The simplest of these is a round nail with a dulled sharp point. They are used to roughen or indent the ground between the patterns. This, as a tool, is called a *pick*. Other matts are cross hatched, like office-seals, or with points like a small o, or stars or crosses, leaves or flowers. One like the flattened point of a round nail (• • •) is most common. *Vide* Fig. 76*b*.

Border Tools are large matts or stamps. Where we have, for instance, a border of two lines run with a tracer, we may repeat in it at regular intervals, side by side, a circle or a cross of four semicircles, a diamond or a leaf. For these special stamps are made. But even these figures can be made with a flat small tracer of one-tenth of an inch (-) with care.

A Ball Tool, Fig. 78, *a*, is a punch or matt with a round end, like half a pea. It produces an indentation.

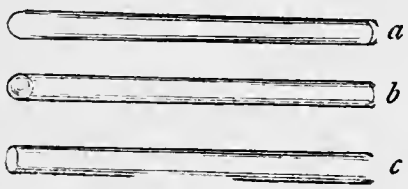


Fig. 78.

A Cup Tool, Fig. 78, *b*, is the reverse of the ball tool. It produces a round rising relief. Similar tools, both hollow and in relief, of diamond, or oval, or star, or other shapes, are sometimes used.

In addition to these, the beginner will require a very black soft lead pencil, thin but very tough strong paper, carbon paper, black or blue, and an agate or bone or steel point. Also small screws.

The panel of wood and the brass should be of the same size, and the brass should be fastened at the edges with the small

screws. Do not use tacks or small nails, as they are apt to pull out. Let them be about one inch apart. Fig. 79.

Then draw on the brass a straight line, or a number of lines, either with a lead pencil or ink, or a crayon pencil, half an inch apart. Take the flat or smooth tracer in the left hand, hold it vertically, and *while moving it along* keep tapping on its top with a hammer. The motion of the tracer and the tapping must be simultaneous. As a preparatory exercise you may take a piece of cardboard or very thin metal and draw a line by hand without the hammer. This will give you an idea of the line to be produced. It must be even, or *without a break.* Do not first

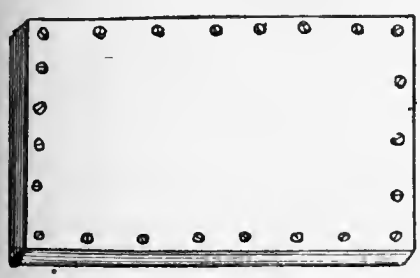


Fig. 79.

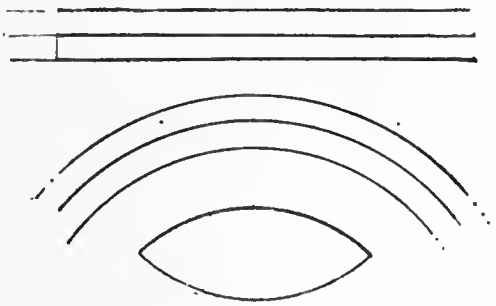


Fig 80.

stamp the tracer, as many do, and then repeat the mark. Run it on continuously.

The tracer with a dotted edge for finishing is not however *run* along. With it you make successive marks, taking great pains to unite them in a clean line. This finishing may or may not be executed, according to the work.

When you can run a clean straight line, and not before, draw long curves and run them in like manner. Such curves joined form leaves. Fig. 80. Do not make these lines too lightly nor too heavily.

You may now draw a simple pattern, say a circle or leaf. Take any simple matt, and with care indent the ground round it. Bring

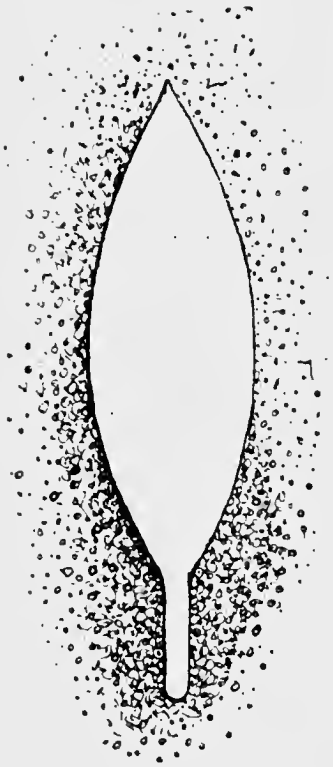


Fig. 81.

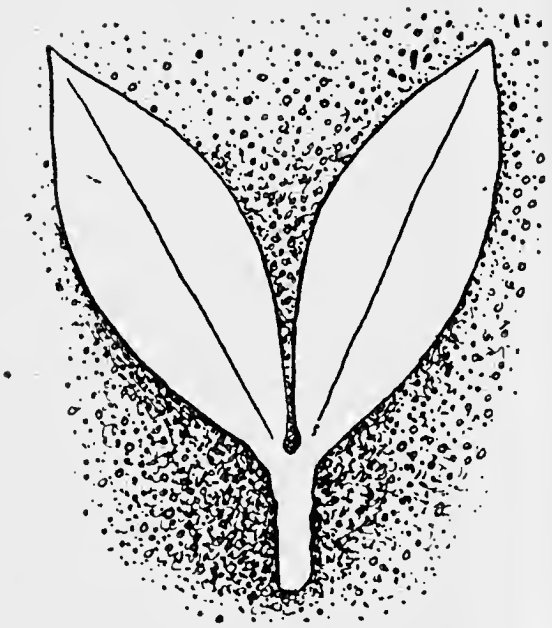


Fig. 82.

SIMPLE EXERCISES.

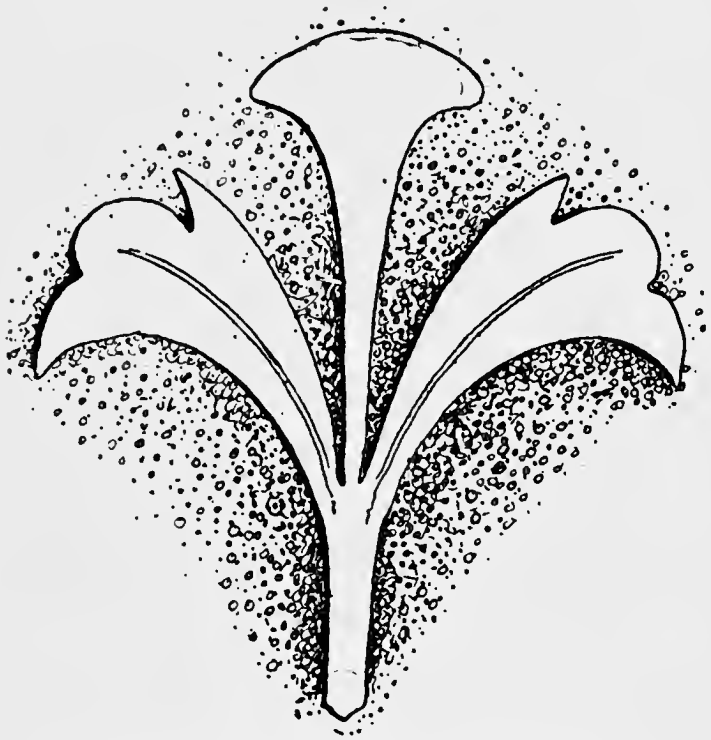


Fig. 83. STUDY OF SIMPLE FLOWER FORM.

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this indentation close to the line made by the tracer. Then go lightly over the line made with the tracer. Figs. 81-83.

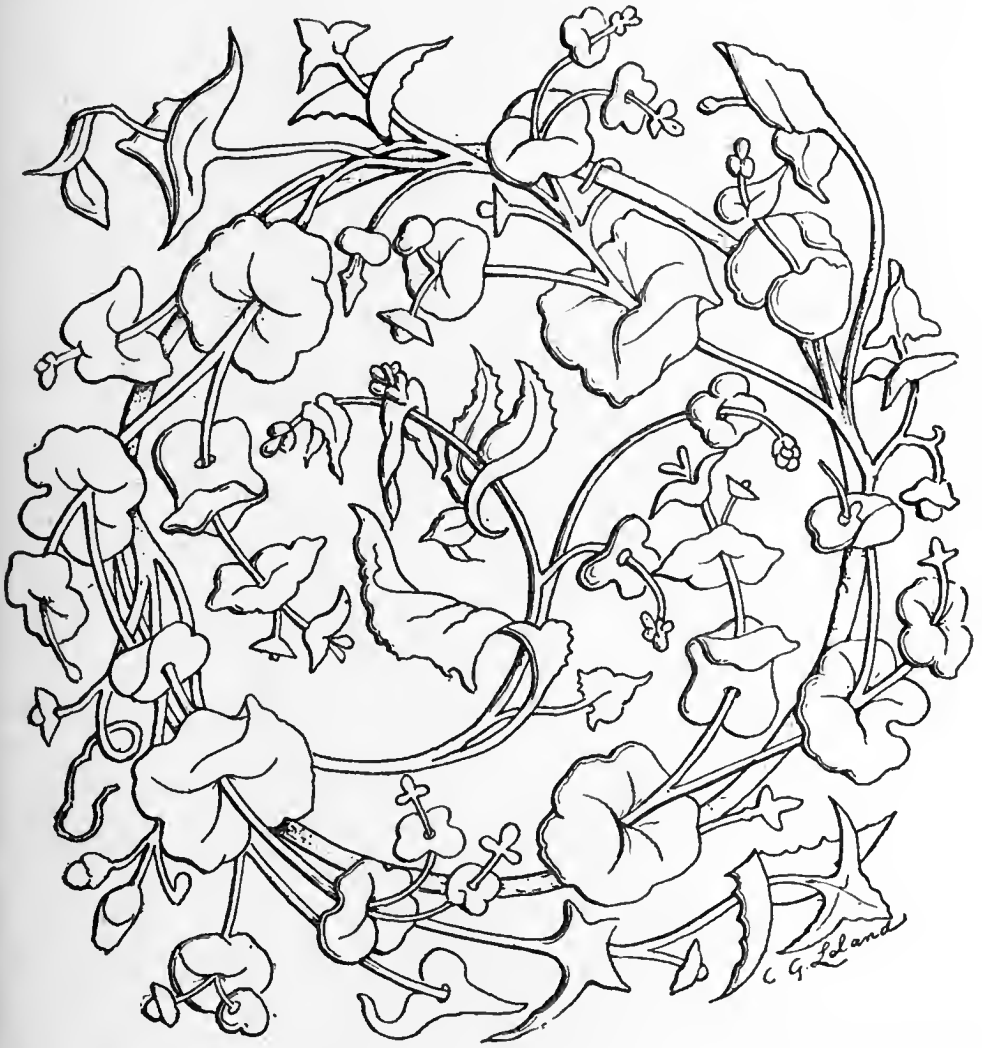

Fig. 84. STUDY OF WEEDS, ENTIRELY IN OUTLINE, WITH TRACERS.

Let it be impressed on the mind that the pupil, before going further, must learn to run the lines and execute the matting or grounding with perfect ease, confidence, and accuracy. One

hour of earnest work at this stage may save weeks or months of feeble and amateur-like labour in the future. Fig. 84.

To prepare brass for work, either pass it through a roller if it be not perfectly smooth, or else iron it flat with a common flat-iron. Then rub the surface with fine sand-paper, or with pumice stone or emery powder. Then screw it to the board.

To draw the pattern on brass, execute it first on thin strong paper with a very black soft lead pencil or with a crayon pencil. Then lay this, face down, on the brass. To hold it in place you may gum the edges to the metal. Then with an agate burnisher or a paper knife, or any smooth hard substance, rub the back, and the pattern will be transferred. If not quite distinct, draw it over with pencil or ink.

Another way is to lay black carbon-paper on the brass, and on this the design, and go over the whole with an agate or bone point, or even a *very* hard lead pencil.

A third method which I have often employed, is to lay the pattern on the brass and go over it with a prick-wheel, which may be bought for 9*d.* at the shops. Fig. 85. This will leave lines of small dots in the metal. Go over them with pencil or ink.

Fig. 85.

Having the pattern on the metal, outline it with the tracer, and note that the accuracy and clearness with which this is done will determine the value of the whole work. Then execute the matting. Take great care not to cut through the brass; if you attempt to produce a finished line at the first effort you will be sure to do this. To avoid it go over the line.

Ancient brass was so hard and brittle that it could not be easily worked on wood. It was the discovery by me, that as now made it is more ductile, which led to working on wood. But if the pupil finds that after much hammering the brass

becomes hard, and brittle, and breaks easily, it may be softened by laying it on a fire till it is quite hot, or even red-hot. This process is called Annealing. To dispense with it, endeavour to avoid too much beating and needless repetition of matting. The art of producing the most effect with the least work will come with practice. As a rule, annealing is seldom required in working on wood. If the brass be cut through, any tinsmith will solder the breaks, but it is well to learn to do this yourself.

Where there are very small curves and corners, the worker must use the smallest curved tracers, and the pointed matt. Figs. 86, 87. With a little experience he will soon overcome all such difficulties.

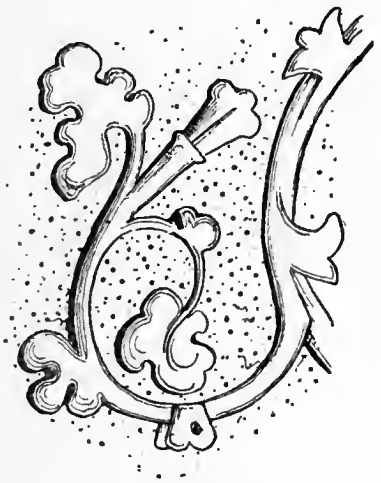

Fig. 86. STUDY OF SMALL CURVES.

Working on wood is only discredited by some because they have never patiently experimented with it and discovered all its capabilities. When the pupil has found out by careful work how far he can go and what degree of relief he can produce,—and this is far greater than is generally supposed,—he can greatly increase the relief in two ways. One of these is to take the metal from the wood, and glue on to the latter, where a high relief is needed, another piece cut to shape. On this the metal will, with careful work, assume a high relief.

Another method is to apply, or fix, a lump of cement on the wood, and work on it. This forms a transition stage to working on the mass of pitch, but is extremely easy. Where the pitch and brickdust cement cannot be had, shoemaker's wax mixed with dust or dry clay forms a tolerable substitute.

What is to be specially noted in minor art work is, that perseverance and ingenuity will enable any pupil, with even scanty

resources, to accomplish more, and develop more readiness and confidence, than if he had a well-fitted workshop and every convenience. He who learns by attending carefully to the rudiments to make the very utmost out of everything (which is seldom done), will, when provided with abundance of tools and materials,

Fig. 87. Ornamental Plaque.

make surpassing progress. I have known boys of thirteen and fourteen years to produce on wood, in my school, beautiful repoussé work in high relief, which skilled workmen declared it was impossible to make save on cement or pitch.

A block of lead one inch in thickness is specially adapted to

sheet-silver work, and for fine or delicate brass repoussé. It is not nearly so *easy* as working on wood where large patterns are used, nor does it permit such bold relief. Lead is generally used by jewellers.

It is worth observing, that if the pupil has really mastered working on wood, it is *much* less difficult than working on pitch, so far as moderate reliefs are concerned (which are all that are required in more than half the articles made in sheet metal), while the results are, of their kind, fully equal to anything made on pitch or cement, if the worker gives the same amount of care to them. In the Middle Ages an enormous proportion of all the decoration, now so much admired, whether in wood-carving, wall-painting, or leather-work, was the result of a thorough knowledge of the merest rudiments.

I would have it, however, distinctly understood that I do not at all give preference to wood, or anything else, over pitch or cement, especially for deep relief and elaborate work. But I insist on it, that in every instance where I have heard or read of wood being decried altogether, I have found that those who did so were *utterly ignorant* of its capacity or what can be done on it. Neither did they understand what Karl Krall, one of the first artists in England, has recognized, that working on soft wood is the most practical, easiest, and cheapest method for beginners, and is therefore the best. It is very important that, for such beginners, everything shall be as simple as possible, therefore, as hammering on wood is far simpler than on cement, young people can learn by it more readily.

It was entirely from its great cheapness, ease, facility of transport, and cleanliness, that brass-work on wood became very suddenly popular, and if *repoussé* on cement has since followed in its wake and is now extensively followed, it owes its prosperity to the beginning made by the former.

Repoussé can also be admirably executed in *raw hide*, *i.e.* of

oxen or cows, which, when dry, is hard and yet tough. This is a material as yet little known except in America, where the

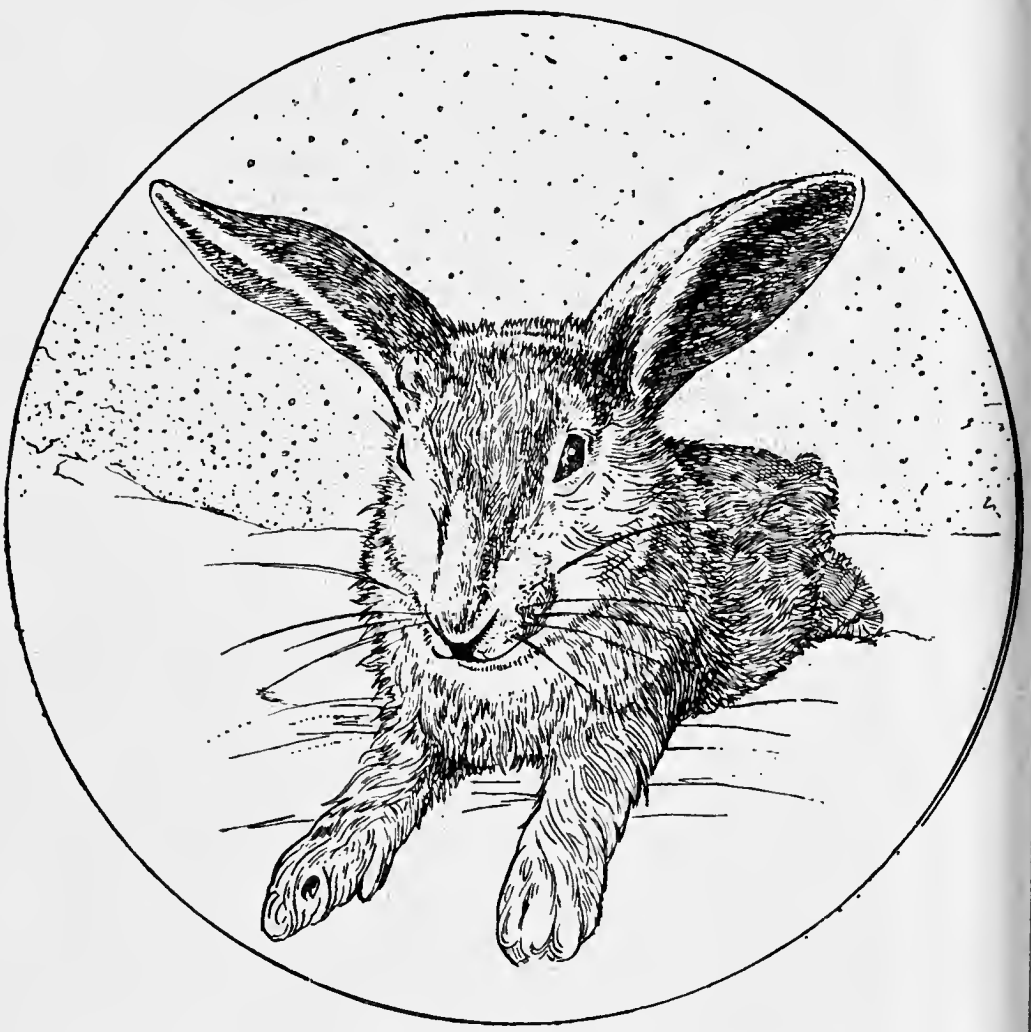

Fig. 88. REPOUSSÉ, WORKED WITH FINE TRACER OR ETCHED.

most durable trunks in the world are made of it. In Italy the most beautiful of leather-work was made of raw hide, stamped or cut.

It is worth noting that all the process for working sheet brass on wood is almost exactly applicable to sheet-leather work, so that in learning one we learn the other. Even the same tools are in a great measure used.[1]

Relief may be increased by placing on the wood layers of pasted paper, felt, or card, or pasteboard, the use of these depending on the thickness or quality of the metal. Willow-wood, when it can be obtained, admits of a very deep relief.

All kinds of lines can be executed on metal surfaces by stamping with the hammer, but for these, of course, different *matts* or tracers are needed. With a very small and not too dull (nor too sharp-cutting) tracer (*e.g.* –), and with one or two slightly curved (*e.g.* ⌒ ⌒), one can execute hair on animals, and in fact all the ordinary details of pen-drawing. Care must be, however, taken not to cross over or mix lines when it can be avoided.[2]

It is not unusual, even when there is a large surface covered with a small embossed, chased, or repoussé pattern, to polish the whole equally. The result is to greatly diminish the contrast of light and shadow, which it is the real object of embossing to produce; and what is more, this relief disappears with every fresh cleaning. The numerous and minute details often so freely imparted as to how to use machinery, tools, sand, lime, dipping in aquafortis, etc., must be consulted with great caution by all beginners. Rotten-stone, or any ordinary soft cleaning powder, with spirits of turpentine or sweet oil, and then an application of petroleum with a soft rag or chamois, will answer all ordinary purposes.

Oxalic acid is very thoroughly cleansing; care should be taken

[1] *Vide* "Leather Work." Whittaker and Co.

[2] This is also a good rule in pen-drawing; many very eminent artists, such as Callot and the late Rev. Mr. Petit, often executed very elaborate pictures with very little crossing of lines.

to wear gloves while using it, as it is very painful and even poisonous in scratches or cuts. The best preparation with which I am acquainted is a German paste made and sold by Barkentin and Krall, Regent street, who will supply all that is needed for repoussé work.

But while the pattern or relief should, it is true, be kept well polished, the ground may in many or most cases be even darkened slightly to advantage, as by rubbing paint or sulphate of ammonia into the minute dots and scratches of the matting. It is not merely because this makes an object look antique and interesting that this effect is beginning to be imitated so much in art, it is because it really produces a vivid relief, and contrasts shadow with light, also defining the pattern more distinctly. To secure this latter object all pains should be taken in decorative art, especially where the design is at all elaborate or complicated. In most ordinary repoussé work the outline at least may be thus darkened to advantage.

All weak amateurs, and those who are feeble as regards design, are greatly given to produce large aggregates of petty ornament, and it is precisely this kind of work which is soonest and easiest polished into invisibility.

REPOUSSÉ ON PITCH.

TO get the highest relief in sheet-metal work we must of course push the pattern out from the back, and not drive the back in from the face. To do this the sheet must be laid on some substance which will oppose a moderate resistance, and yield a little to every blow, but not give way all at once. The substance best fitted for such a resistant consists of a *cement* made of about one half Burgundy pitch, and one half of brickdust, or of brickdust and plaster mixed. In some cases where we need a body which is more yielding, this is tempered with a little linseed oil and rosin. Pitch and dust harden too much in cold weather, therefore, and especially in America, where there are almost Russian winters and tropical summers, the composition of the cement is a very important matter. Dealers in tools for chasing and sheet-metal work generally sell a carefully prepared cement in cakes, which saves the great trouble of heating and mixing.

For repoussé on cement, or, as it is generally called from its chief ingredient, "pitch," there are needed, in addition to the tools

already described as used for embossing on wood, certain others. It will be at once seen, from the cost of these and their bulk and

Fig. 89. Repoussé, High Relief. From the Baptistery, Florence.

relative difficulty of management, why it was that when the easier process was made known, or hammering on wood, it became so

popular; and if repoussé on pitch has also become of late popular the fact is due to the impulse given by the humbler art.

The tools referred to are as follows.

A chasing hammer, and one of a heavier kind.

Beaters. These are stamps of different sizes, and with more or less rounded, flat, or oval heads. They are intended to beat hollows into the metal. Fig. 90.

A tin or iron cup to hold the beaters, tracers, and matts.

One good mallet.

A spatula or metallic spreader.

A pair of strong compasses and *a square.*

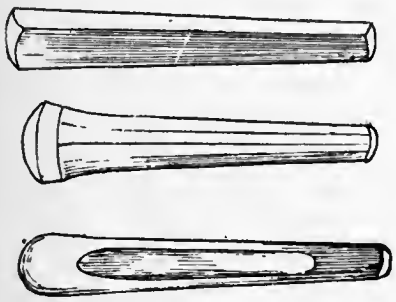

Fig. 90.

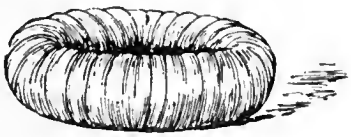

Fig. 91.

Fig. 92.

A cushion to hold the work. Fig. 91.

A strong bench.

A pitch block, i.e. a stone slab, one inch thick.

A chaser's bowl.

A pitch pan. A common frying-pan will answer for this. Fig. 92.

A bottle for pitch.

A stove, or fire.

A small iron stool for the stove.

The pitch is laid on a bed, which varies according to the shape and size of the work. It may be a block of stone, or a flat pan, a piece of plank with raised sides, or a wooden bowl. It is some-

times applied in small quantities to special surfaces, for the purpose of working small objects; and again, cups, goblets, and hollow vessels, are generally filled with melted cement, and when this is hard they are worked on the outside face.

Having melted the cement in a pot or boiler, dip it out with a ladle, and pour it into the pan or on the stone, gradually, till it is, let us say, an inch deep. Before it is too hard, lay the brass plate with the design already drawn on it, and bring enough cement or "pitch" over the edges to hold it firmly when cooled. This is done with the fingers, which are dipped in water to prevent the pitch from sticking to them. A *spatula*, or flat knife, is often used in treating the pitch. The pan is most convenient for beginners, as it can be filled and kept till needed. All that is necessary is to re-warm it, or else warm the brass and press it on, when the cement, as it cools, will hold it fast.

Now take *a ball-headed tool*, and with the mallet gradually beat in the brass into the cement, before it is quite cool. *Do not attempt* in this, any more than in working on wood, *to get to the full relief all at once anywhere.* Beat it at first shallow with a large tool in the large hollows, and then do the same with a smaller tool in the lesser parts, and so on, moulding or sculpturing, as it were, in a hollow. If you are very careful and patient, it is probable that you may make a good piece of work at the first trial.

All directions in print as to how to handle or manipulate the tools to give a form are only bewildering, and quite as useless as attempting to tell how one should model in clay. If the beginner has already a model or cast, or beaten work exactly like what he is trying to produce, it will, however, save him a great deal of uncertainty and trouble; so much indeed, that this may be regarded as really indispensable where there is no skilled teacher to direct his work.

When the work appears to be finished, the pitch can be

warmed, the work taken out and washed clean with petroleum, and then, if it appears to be imperfect, repeat the process. If it seems to be all right, then, filling it well with cement, lay it *reversed* on the pitch, and when hard work it on the face. In

Fig. 93. COPPER SCALDINO TO CONTAIN BURNING CHARCOAL. VENETIAN WORK.

this stage the outlines are renewed or sharpened, and the matting or roughening the ground to give a dark relief to the shining pattern is executed.

To work repoussé on a jar, pot, or vase, etc., fill the vessel

with "pitch" or cement, and then let it cool and harden. To remove it, heat it again.

If the pupil will be contented to begin by simply working a hemispherical figure like half an orange, and then perhaps a pear, by itself, and so on through a dozen easy models, with great care, without hurrying to produce something remarkable, he will really need no teaching whatever. But it is so usual for even elementary books to set forth difficult *show-pieces* even for a first lesson, and almost all beginners are so ambitious to display what seems to the ignorant to be a masterpiece as a first effort, that it would seem to be almost useless to insist on this. But as I have said, and all sensible writers on repoussé agree with me, it is really and truly only by observing closely the manner in which relief or depression follows one's moulding or manipulating, and by *thinking* and trying, that one learns to repoussé anything, and not by being told or shown how; and it therefore follows inevitably that if the pupil would begin by very easy efforts, and thoroughly mastered everything as he went along, on the "acquiring strength by going" principle, he would have little or no need of a teacher.

After the pupil has *thoroughly* learned the rudiments of an art, it is almost useless to describe the advanced processes and great difficulties, for the simple reason that they are rarely, if ever, *read* by anybody; for these are always more easily acquired in the studio or workshop from seeing others working, or by divining them from models and works of art. Yet it is precisely these difficult things to which the authors of "elementary" books of instruction devote most time, as if they were either anxious to show how much they know, or were apprehensive of being considered ignorant, while the *rudiments*, in which nine-tenths of all education lies, are slurred over. And for this reason I beg all who follow this book to execute *easy* repoussé, especially on pitch, with careful slowness, and if they do, they may be sure

that I have clearly shown them enough to produce great or good work, if they are ever destined to do it.

I beg the pupil to pay special attention to this fact following: Hammering in high relief on pitch is effectively the same thing as modelling in clay or wax, the difference being only this, that metal and different tools are employed. Now it is in repoussé exactly the same as in modelling—the most apparently difficult curving, moulding, and turning, are nothing but the work of the first lessons repeated perhaps many times. Thus if you can

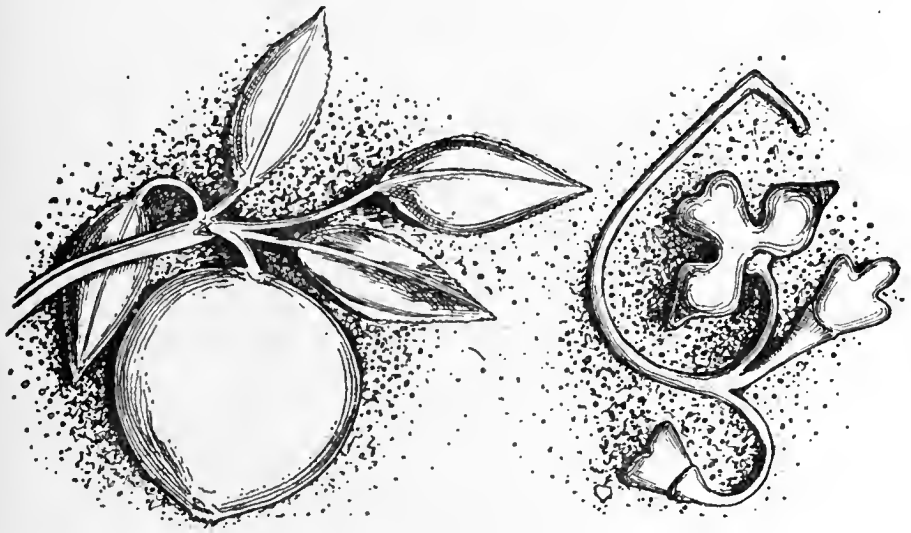

Fig. 94.

repoussé so simple a thing as a pear or a curved leaf, Fig. 94, *and will have the patience to execute it with great care, several times*, before proceeding to more ambitious work,—that is to say, make it till you can do so from memory, with perfect confidence and ease,—you will not only find that most large pieces *involve quite the same work over and over again*, but also that you have saved yourself months of work by perfectly mastering the first steps. In Decorative or Minor Arts—design apart—careful mastery of the rudiments is equivalent to genius.

There are very few people who reflect when they see a beautiful design that it is probably only a *simple* pattern doubled or quadrupled, with perhaps some trivial alterations, or that the most bewildering and complicated designs may be made by any child, by the simple process of cutting out two easy patterns in lines and laying one on the other. And I have found many very well-educated people who were astonished to learn that a

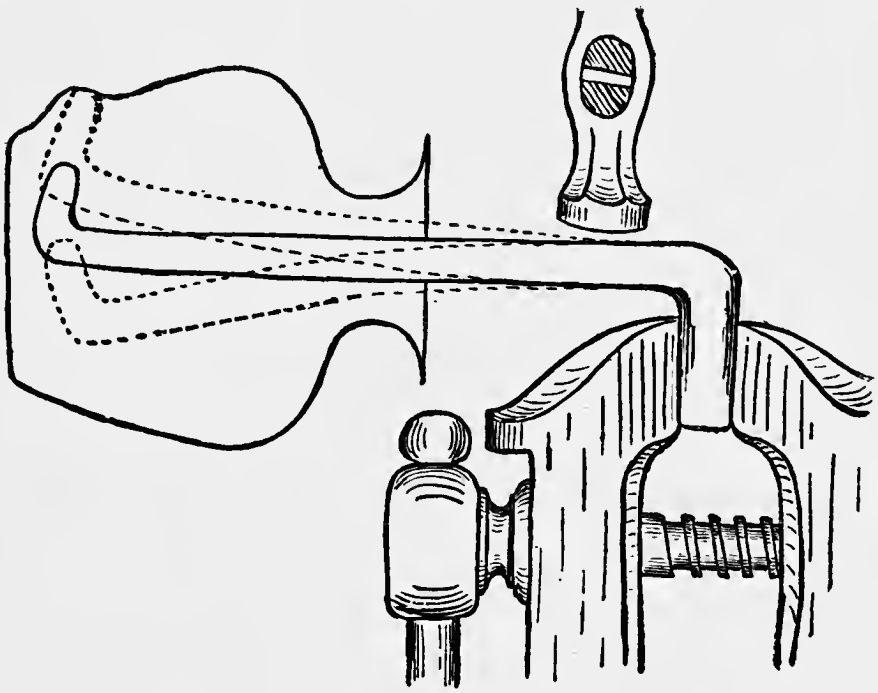

Fig. 95. SNARLING.

wall-paper whose design was to them quite a mystery, consisted of nothing but a single ornament repeated and connected by a vine, the construction of which is to the last degree simple and mechanical, and which anybody can learn to make in five minutes. This is precisely the case with higher *repoussé*, of which it may be very truly said that *all its difficulties lie in the preliminary details.*

Snarling. This is a very curious element in embossing metal. The reader is probably aware that the very moderate tap of a hammer on metal produces at least a slight indentation, and that if repeated, on the "continually dropping" principle, a very large cavity can soon be produced. On this principle a long

Fig. 96.

curved bar of peculiar shape, held in a vice, and frequently struck with a hammer, will keep vibrating, and if its vibrating end strikes all the time on sheet metal, it will of course bend it. Now as it is impossible for us to hammer, let us say, inside a narrow-necked copper vase, and beat out the side into a

given form, this is most ingeniously and very easily done by *snarling*, that is, by introducing the end of the iron into the vase, so that it touches the spot required, and hammering on it. To do this the vase or bottle or cream-jug is placed on the chaser's bowl, and this on the cushion to steady it. *Snarling irons* are both light and heavy, and they are not confined to working inside vessels. When the vibration is given by a treadle or by the aid of a second person, it is easily applicable to a great deal of work, and is saving of much muscular exertion to the artist. Begin by snarling on a bit of waste brass or tin, and you will at once learn the method of working.

Snarling involves the same principle as spinning, and both that of making pottery on a wheel; that is to say, we avail ourselves of the principle of producing by means of a machine a greater amount of force, or more frequently repeated blows, or a more persistent and effective pressure, than we could do by the hand alone. *Vide* Fig. 95.

PATTERNS FOR REPOUSSÉ WORK.

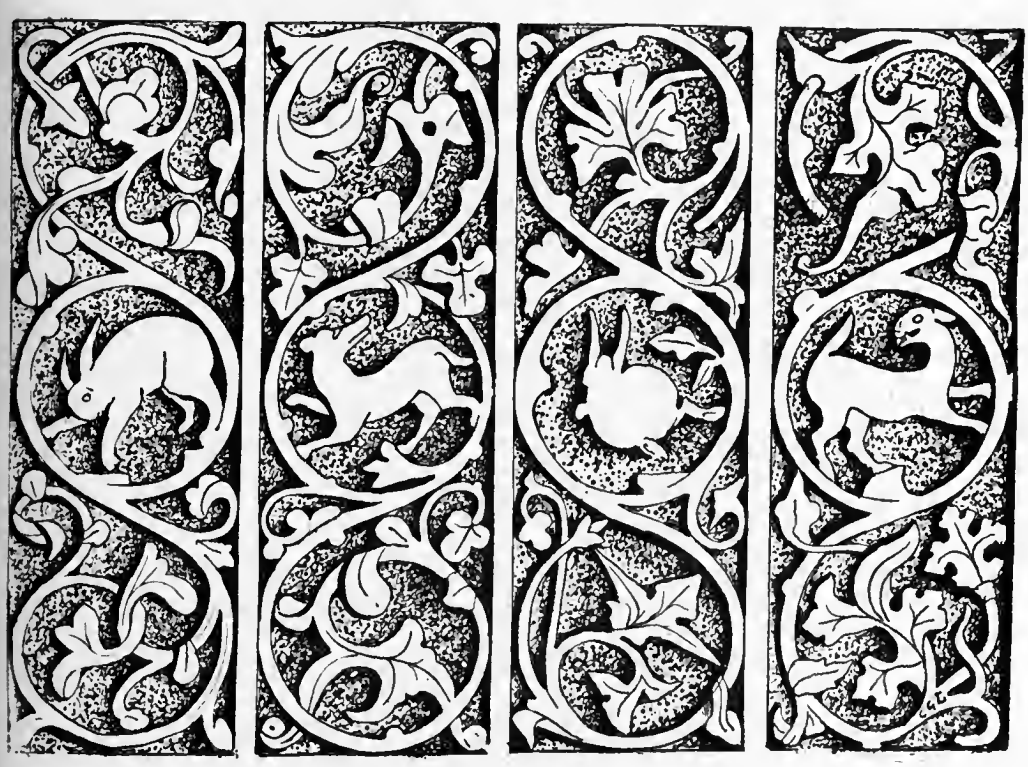

Fig. 97. PATTERN EITHER FOR A PANEL OR FOR A CYLINDRICAL VASE. It may be enlarged, if necessary, by repeating one or more of the divisions.

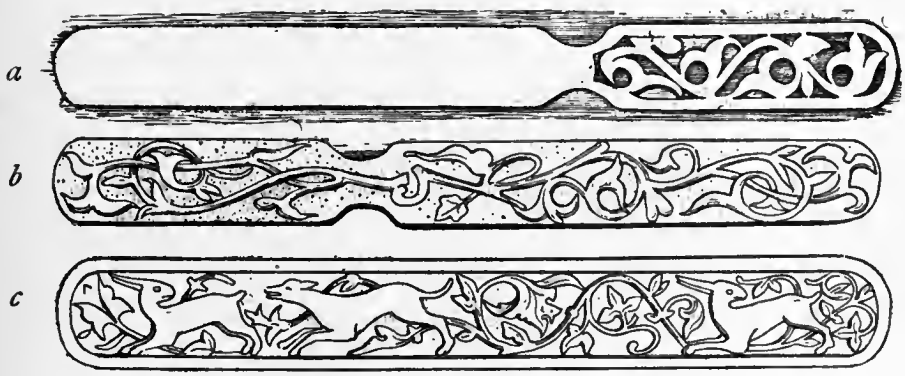

Fig. 98. PAPER KNIVES : *a*, SAWED BRASS ; *b*, *c*, REPOUSSÉ.

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Fig. 99. SALVER.

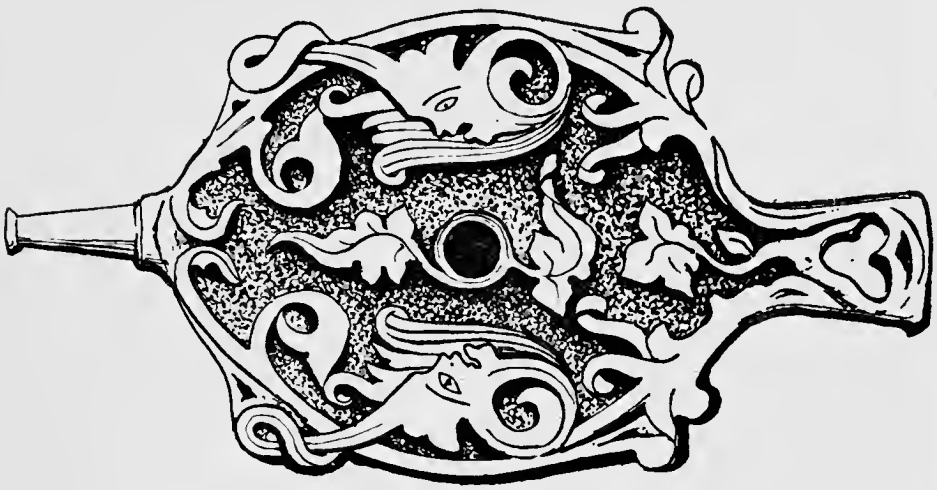

Fig. 100. BELLOWS.

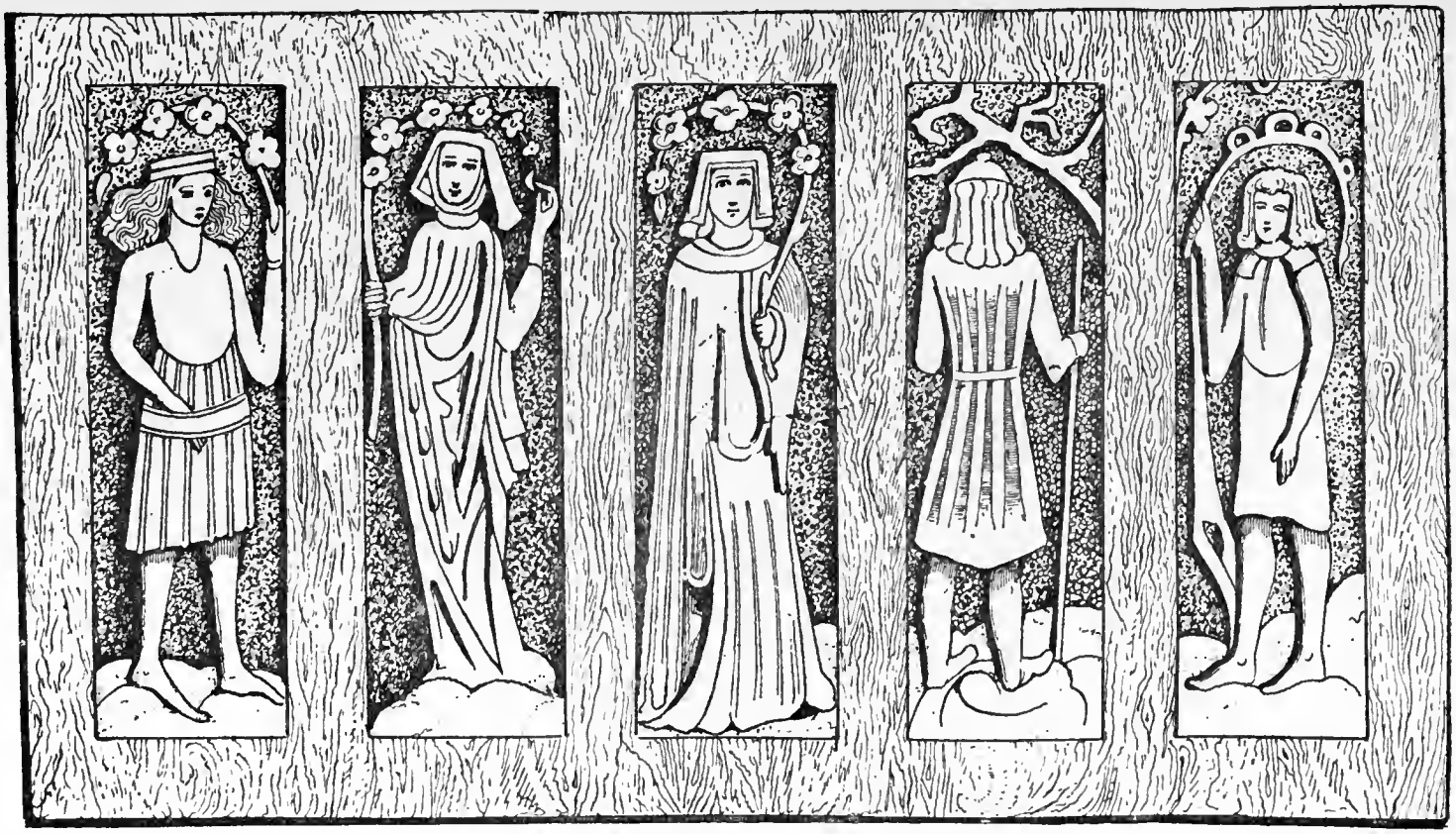

Fig. 101. Repoussé Panels set in Wood. Florentine Work, from a Fourteenth Century Design.

Fig. 102. DESIGN FOR SALVER.

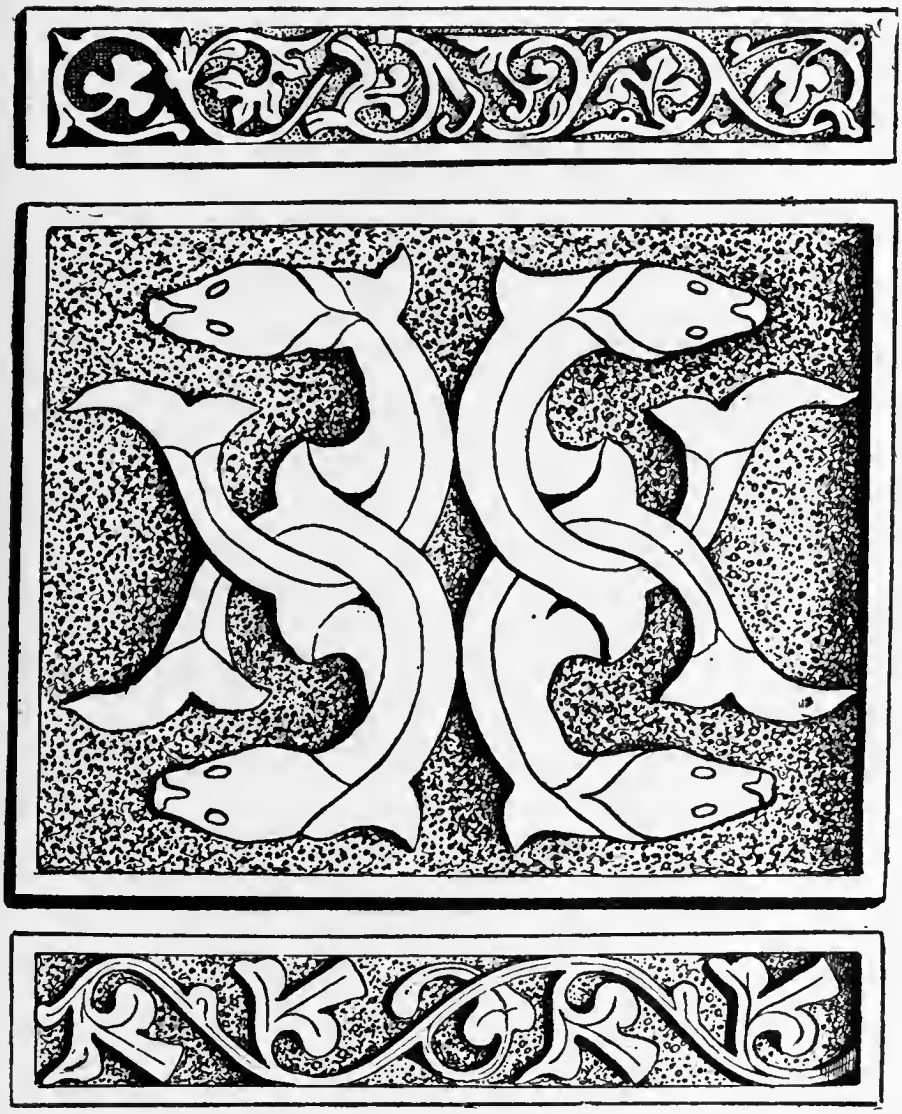

Fig. 103. Repoussé Panel.

Fig. 104. Roman Repoussé Work in Bronze. Fifteenth Century.

(In the possession of the Author.)

Fig. 105. NECKLACE WITH PENDANTS.

ORNAMENTAL SILVER WORK.

Fig. 106. SCOTTISH CROSS: ENGRAVED SILVER.

THERE are many very pretty silver ornaments which any lady might wear, and yet are extremely easy for any girl or boy to make, and require very few implements. I have seen in Nubia very neat objects of the kind actually hammered from coins with only a nail and a stone, and among the Red Indians of America a hammer, a pair of scissors, and a flat-iron, suffice to make a great variety of decorations. Of these latter, known as *Nispeman'l*, I possess more than a pound in weight.

The metal for this work is generally obtained by hammering silver coins flat; but the amateur may begin with real or German silver, which is sold in sheet form of different degrees of thickness, some silver wire, and for advanced work some silver solder. The first and easiest thing to make is a shawl-brooch. Take a sixpence or a shilling, lay it on the anvil (as before said, the Indians use a flat-iron reversed), and with a small hammer gradually and carefully beat the coin into a saucer shape. Fig. 107, *a*, *b*. If

neatly done, it will be quite smooth. Do not make it too thin or it will bend too easily, and not wear well. When this is done, take a file and make a hole of from half an inch to three-quarters of an inch diameter in the centre. With a round cutting punch and a blow of the hammer this round centre may be cut out, and the bit thus removed may serve as a pendant.

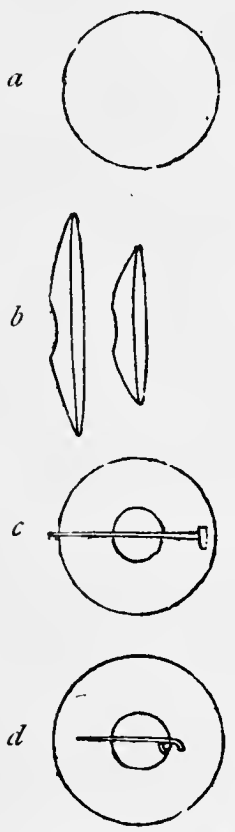

Fig. 107. A Silver Brooch.

This done, bore a small hole in the edge of the brooch, pass a strong pin through it, bend the dull end into a ring to hold it, and the brooch is finished. Fig. 107, *c*, *d*. It may be observed that any small jeweller will solder a pin—which will be better than the bent one—for sixpence, and that a steel pin is better than one of silver.

To use the brooch, pull the shawl through the hole, put the pin through it, and the shawl, as it pulls, holds the pin down. It is not uncommon in Scotland for people to make penny pieces into brooches by the simple process of filing a round hole in the rim, and, without hammering, adjusting a pin to it.

These brooches may be ornamented by etching with nitric acid, and the lines nielloed with ammonia and sulphur as before described (p. 54), or they may be hammered in repoussé. Fig. 108. I possess a broad silver brooch which I once dug out of an old Indian grave. On it is a figure of a bear, which had been neatly pointed in with a *dot-wheel*. A dot-wheel is a little implement which is used by shoemakers, and which may be bought for ninepence. Fig. 85.

A silver chain is very easily made. Take the bit of wire, turn its end once round the round-nosed plier, then hold the ring in the flat plier, turn the other into an S. Of course the ends meet,

like a figure 8. Then cut a second bit, repeat the process, link one into the other, and so on.

Two strands of silver wire may be twisted, or three may be braided into a cord, which may be made into a necklet or bracelet, according to its length. When two are twisted a loop may be made at one end, and the two bent into a hook at the other to catch the loop. Where there are three braided, one of the wires must be secured by soldering or winding its end round the other two. It is advisable to make such necklets and bracelets first in bell-wire before venturing on silver.

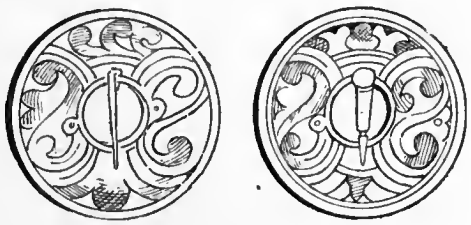

Fig. 108. Old Scotch Brooches roughly engraved.

When the silver wire is very thick, a single piece curled once or twice round the wrist, and simply cut off, makes a neat bangle. To this pendants may be affixed or hung.

A simple flat band of sheet silver, worn round the wrist, and lapping over at the ends, can be cut by anybody with a pair of shears or even strong scissors, and it makes a very attractive ornament. When nielloed with ever so little skill it is very pretty. With the round or ball punch bosses may be worked on these flat bangles, and the outside ornamented by chasing, acid-etching, or repoussé.

An endless variety of beautiful ornaments for pendants is made by the simple process of cutting out from sheet silver, with a pair of scissors, any kind of figures suitable. Even the ancient Etruscans, who surpassed the first artists of modern times in a perfect knowledge of the art of jewellery, took a great pleasure in this simple, easy method of making pendants, by merely cutting out and stamping thin gold and silver metal, and it is found side by side with the exquisite powdered gold articles, which, according

to Castellani, no one can now imitate. And if there was not now prevalent in the world a vulgar belief that excess of expense, labour, and finish constitutes "beauty" in jewellery, we should now see ladies wearing ornaments made by themselves according to their own original tastes and designs. Fig. 105.

The easiest way to make these is to draw the figure on ordinary paper, paste it on the sheet metal, and then cut it out with fret-saw or scissors. If there be "inside spaces" where the scissors cannot be used, then lay the plate on the anvil (a block of solid lead is far better), or even a block of hard wood, and cut them out with a cutting-tracer or a file. Silver is very easy to saw.

I have a pair of very pretty silver earrings which I bought of an American Indian woman, and which are made as follows: Take a piece of sheet silver of about an equilateral-triangular shape. Roll this into a long cornet or horn of a narrow cone shape. Fig. 109. Leave enough of a hole at the point to pass a wire, either to form a hook or a loop. If you choose, a coral bead may be put at this end, the wire passing through it. Before rolling up the silver with the pliers, practise making such cones with thin brass or tin. These cones also serve as pendants for brooches. A very pretty, substantial pair of such earrings, with the coral beads and wire, would not cost more than two shillings, and they would be much more attractive than most of the machinery-made and more expensive articles of the kind generally worn.

Fig. 109. EARRING.

Silver wire may be braided, twisted, and woven into many kinds of ornaments. The very pretty chain pattern shown in fig. 10 on page 9 may also be adapted for a bracelet, and when so worked is called "open" filigree work—when soldered on the plain surface of rings, bracelets, or other ornaments, it is "applied" filigree.

The wires plain and twisted, when soldered along the edges

of work, impart to it a very good finish, besides strength and durability. I should advise every worker to invent new ways and forms in the arrangement and manipulation of plain and twisted wires of various thicknesses, without following the special types characterizing the filigree work of each country; and he will find that when finished and polished, the reflected lights and shadows of these wires will prove very effective and pleasing.

One other excellent adaptation is to solder on wires to represent the mid-rib and side ribs of foliated ornaments (see figs. 49, 53, 55, 61), using thick wire for the main lines, and thinner wire for the remainder, and if a different metal is adopted, say silver or brass wire on iron ornaments, and copper wire for brass or silver ornaments, the contrast when finished is very gratifying. Tracery and Gothic leafwork of the thirteenth and fourteenth centuries have frequently been finished with this enrichment.

As I have described, any silver coin, from the size of a sixpence up to a crown, may be easily beaten into sheet silver, and formed or cut into jewellery or ornaments; and the processes are so easy that any girl who will first make the experiment with a few pennyworth of *very thin* brass or iron, or even sheet tin, will find at once that it is extremely easy to make objects which are pretty to wear or easy to dispose of.

It is much to be desired that those who are anxious to stimulate the general practice of Decorative Art among all classes should organize an exhibition of such jewellery or ornaments and objects of silver as are here described, made by amateurs. For the love of such adornment is innate, and since it exists it would be most sensibly gratified by encouraging young women to make their own brooches and earrings or bracelets. This would develop skill and taste at no great expense, and perhaps do more to extend knowledge of decorative art than anything else. I have observed, by the way, that in cases where girls have thus made their own jewellery, they have

taken great pride in it and never tired of it,—so true is it that "a poor thing, but my own," is always a special delight.

Fig. 110. PATTERNS FOR PENDANTS.

Soldering silver, or any other metal, is by no means so difficult a process as it is supposed to be, but when possible it is best to take a lesson in it from some jeweller. Once acquired, it enables

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the workman to make or finish a great variety of articles. Thus ends may be neatly joined, and coins, gems, stones, etc., be soldered into cups or flat bangles, at very small expense, yet so as to greatly enhance the value of an article. Thus I have seen three old Roman silver coins, worth two shillings each,

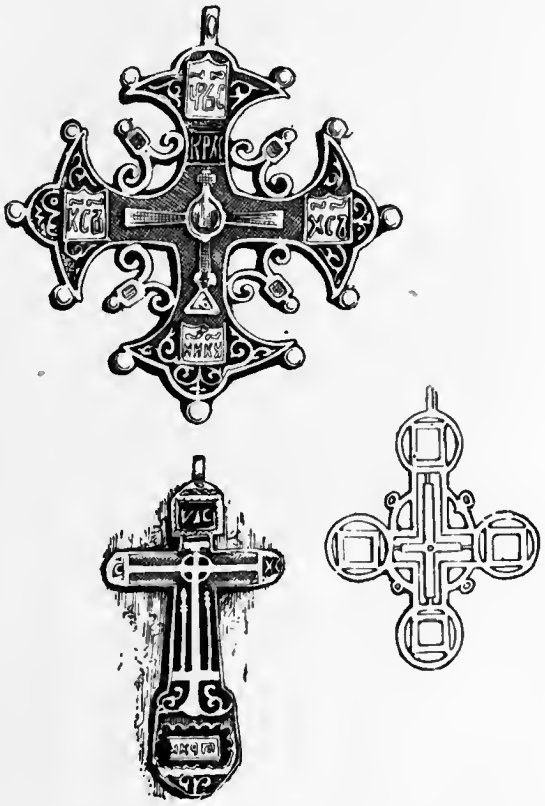


Fig. 111. Russian Silver Crosses in the Possession of the Author.

soldered into a silver cup which cost a pound, for which five pounds was asked, nor did it seem to be too much, as the article was really in good taste.

Silver is frosted or roughened by beating it with a tool like a file, or laying a file on it and beating in the latter. It is whitened by heating it red hot and dipping it into diluted sulphuric acid

(one part of acid to four of water). A wire brush called a scratch brush is also used to produce a finely scratched or frosted appearance.

A silver ring is easily made by putting a pointed iron rod or mandrel into the vice, the point upward. Then take a silver wire, pass it once or twice round the diameter required, and cut the wire and solder it, or twist or clamp the ends. Or you may take a shilling, make a hole in it, put the point of the presser in the hole, place the shilling on the table or block, and keep turning the iron while gently tapping it. The operation requires great care, and it will be aided if you place the ring once or twice in the fire to anneal it.

The pupil may remember that with the fret-saw silver of considerable thickness may be easily sawn with care. A row of ornaments or pendants in the forms of fish, leaves, vases, frogs, or birds thus sawn, with a few touches of repoussé chasing or etching, even if rudely executed, form when hung on a chain a very pretty ornament. These pendants can be made from sixpences a little beaten out. Fig. 110.

Any pattern for a border given in this book may be repoussé-worked on a flat band of silver for a bracelet. Leave about one inch of the band to lap over.

Round holes can be made with a round-pointed file (rat-tail).

If there is any roughness on the edges after fret-sawing, carefully remove it with a fine file and emery paper.

Silver may be nielloed or blackened with the mixture of sulphur and ammonia or nitric acid.

Any leaf or flower is a good pattern for a pendant.

Any one pendant may be repeated many times for a row on a necklace, chain, or wire. Small pendants may serve for ear-rings, large for lockets.

Cut out patterns in thin brass before attempting them in silver. Always cut them first in paper, and then paste it on the metal.

A little knowledge of graving, such as may be acquired in a few days, is a great aid in silver work, especially for the inside lines of leaves. The back of a piece of stereotype plate or a flat piece of lead is best to begin practising with.

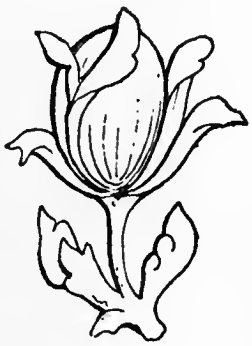


Fig. 112. Old Dutch Silver Work.

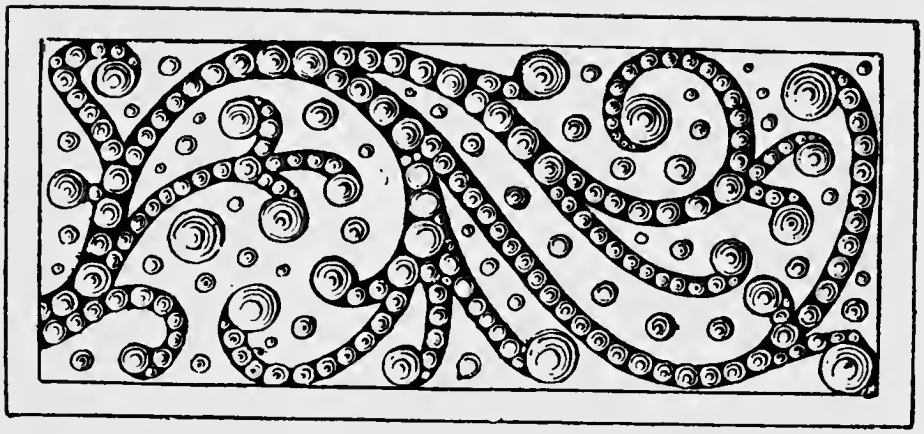


Fig. 113. NAIL WORK.

NAIL, SCALE, AND STENCIL WORK.

NAILS AND NAILED STRIPS.

IT was extensively recognized in ancient metal work that shining points of light were of themselves very attractive, and therefore bosses were so freely used in armour, and even imitated in round coloured spots on cloth. Hence the frequency of grapes and other round fruit in old repoussé or embossed sheet brass work.

This is the leading feature in the work I now describe. This beautiful and very easy style of ornamentation has been very little practised since the Middle Ages, although some very fine specimens of it were executed and exhibited at the International Exhibition a few years ago in London. It consists simply of round-headed or boss nails of iron, brass, copper, or silver, of which many varieties of all sizes may be purchased from dealers in metal-ware. These nails are simply

arranged in rows so as to make patterns, and are driven into boxes or chests.

Boss nails can be very freely employed in strip and sheet metal work, and, indeed, I may say, all kinds of metal work may be freely combined and intermingled.

Harness makers and others have a great variety of elegant ornaments, coats of arms and crests, attached to nails, which can be used for decorating surfaces. I have in my possession a very old flat carved Florentine powder-horn, which has been made very attractive by having fastened to it a stag's head in brass, which was manifestly at first attached to some carriage harness.

For this purpose of ornamenting caskets, cabinets, etc., the Japanese cast a great variety of pretty little objects, which you can find attached to boxes, etc., at a very low price in most Japanese shops.

African savages often make a curious decoration for sword-handles by driving small brass-headed nails or tacks closely together so as to quite conceal the wood. Some of the Red Indian tribes of North America also ornament their whip-handles, hatchets, knives, etc., very curiously with brass-headed tacks.

What is known as Bent Iron, Ribbon, or Strip Work, when attached to wood, is called by Germans "Venetian Nail Work," it being a combination of the two kinds of work, that is, of bent iron rosettes nailed at intervals on the panel. This is not properly nail work in itself of the old English kind, but rather the art of making, firstly, highly ornamented heads of nails in bent iron, repoussé, etching, and casting; and secondly of forming ornaments such as rosettes or bosses, which were nailed on at regular intervals. There is perhaps no kind of decorative work in which such admirable and striking effects can be obtained with so little labour as in this, as it consists of ornaments which are for the most part very easily made.

There is a combination of strip and nail work which was often executed in the Middle Ages, which consists entirely of straight lines, all the angles being made by riveting. This is chiefly applied to flat surfaces, as, for instance, doors of cabinets or boxes. To attach it to a surface, nails are here and there driven through the rivet-holes. The whole method of making it is shown by the illustration, Fig. 114.

A very pretty application of flat metal, brass or iron, is to take a box or chest, and nail strips round it, using round-headed nails for rivets. This was extremely common at one time. Fig. 115.

Flat strips are sometimes interwoven like matting, and when

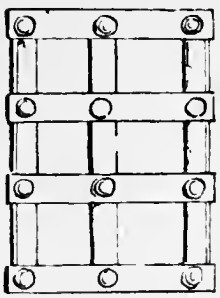


Fig. 114.

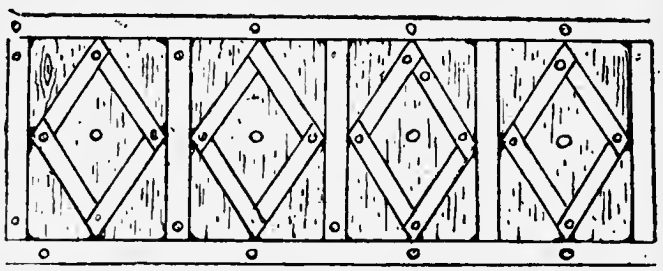


Fig. 115. Box Front.

inclosed in a frame may be used as a diaper ground,[1] on which to rivet flat sheet metal in cut-out patterns. This forms a kind of metal woven fabric. It is pretty when arranged diagonally in the frame.

Arab or Moorish patterns in straight lines, geometrically arranged, which are made from the simplest square crossed with a triangle, up to the most elaborately complicated and elegant combinations, are all adapted to flat strip iron work. The

[1] A diaper ground is one in which the whole is covered with one small pattern frequently repeated. It may be a mere dot, or a little circle like a small o, a flower, a diamond, or a more developed ornament. On such a ground large ornaments may be placed at intervals.

student who can draw or construct, may find full directions how to make such Moorish patterns in my little work on Design.

Nail, knob, or boss work of any kind is specially suited, not only to chests and caskets, because it is suggestive of strength and firmness, but for the same reason to panels of doors, to squares placed above doors and windows to improve their effect, and in many cases and places to furniture. On a small scale it was much employed by the monks in bookbinding, not merely for ornament, but to attach leather to boards, and in many cases to protect the painted or jewelled surface of the cover, when laid flat, from friction.

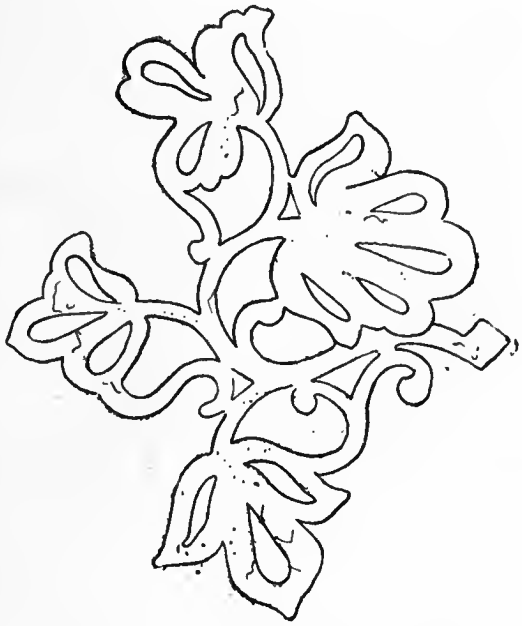


Fig. 116. Pattern for Nail Work.

Where no great relief is desired, ornaments may be cut from flat metal into disks, circles, . flowers, rosettes, or figures, and attached by flat-headed nails to the surface. Fig. 116. Here the nail is properly a mere aid, but as such it plays an important part in metal work, especially when it is a central convex shining point. Thus the attaching of clasps and ornamental covers to books, sidepieces, or ornaments anywhere by means of projecting points, belongs properly to nail work.

It may be observed that nail work ranges from dots the size of a pin's head up to circles, disks, or knobs of any size, also that it includes all kinds of small applied ornaments which are held by a nail of which they are the heads. Therefore (as in bead

work sunk in wood) by making lines of nail-heads we can execute any designs or patterns in lines which we please. Fig. 117.

I should mention that square-headed nails can be bought with which work in lines is very effective.

When the ground or wood is light coloured, the effect of nail work, especially for brass, is much improved by painting the

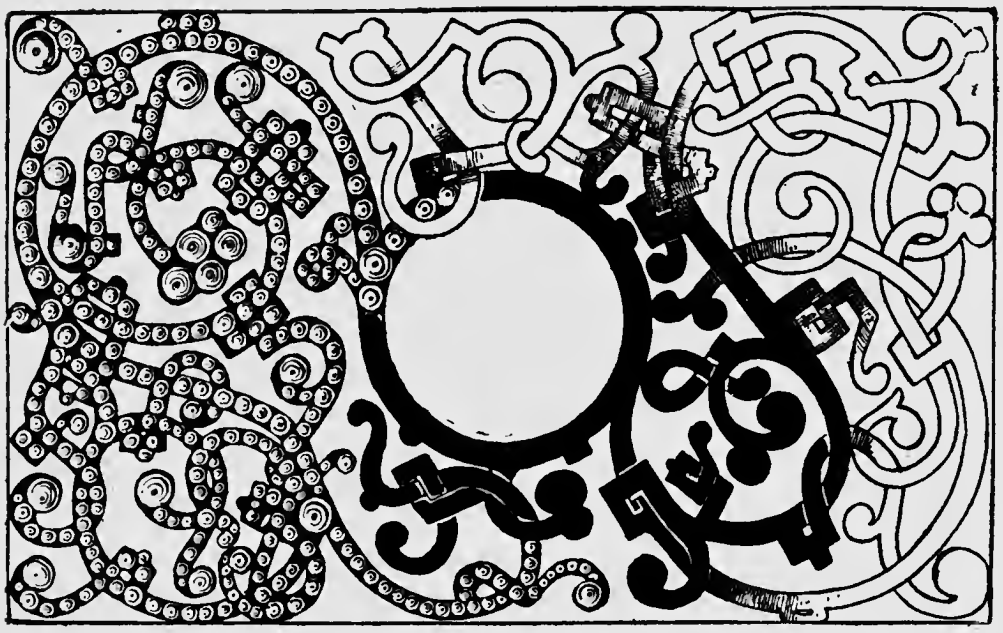


Fig. 117. Complicated Pattern in Nail Work.

pattern in black bands. This method is particularly striking where elaborate patterns or picture-making is desired. It was very much in vogue in old Scandinavian ornament, and was profusely imitated in stone-carving. There is a curious survival of old Norse and Middle Age nail work on black bands to be seen on many old trunks, in which strips of black or red leather formed the band. The effect is improved by making the band a little broader than the diameter of the nail head.

If we have, for instance, a box of walnut wood, very good effects may be produced by taking thin disks of walnut wood with bevelled edges larger than the diameter of the metal knob, and driving the nail into the centre. Fig. 118.

Fig. 118.

The simplest form of nail work consists of driving short pins, or pins which have been shortened by clipping off with scissors, into a panel in lines. Very pretty designs can be thus made with a little ingenuity.

NAIL-HEAD ORNAMENTS.

A NAIL driven in a wall is an ugly object; but the worst and roughest may easily be converted into an ornament. For this there are two ways. Cut out a leaf or sprig with a narrow

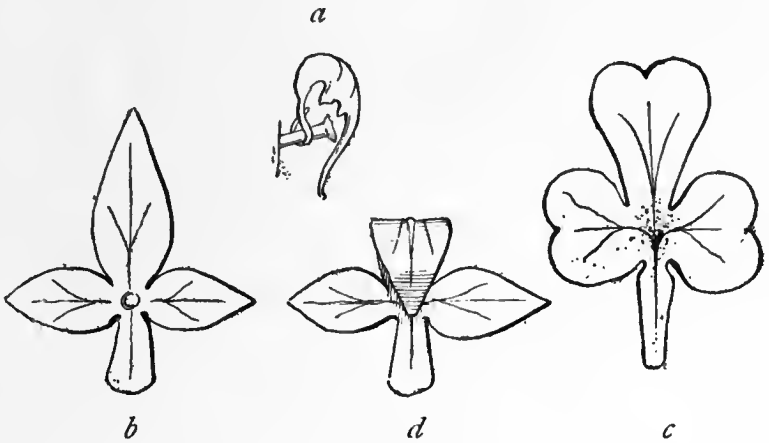


Fig. 119.

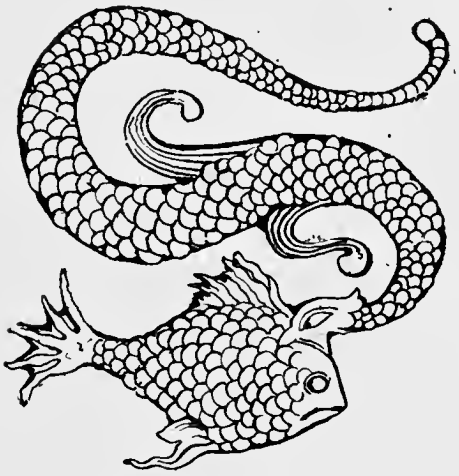
tapering stem, and wrap this round the nail after it has been driven in. Then bend or curve one end of a leaf over the nail. Fig. 119, *a*.

Or, more easily and quite as elegantly, cut out three leaves

united. Drive the nail through the lower part of the stem, hang the picture, and then bend the central leaf downwards, so as to cover the nail. Fig. 119, *b*, *c*, *d*.

This may be still further improved by cutting out the three leaves, or as many as you please, and then nailing another leaf before the central one, and bending the former down over the nail.

SCALE WORK.



SOMEWHAT like this is a very easy and effective style of ornamentation, which has also never been described in any book. This is Scale Work, which can be made from any waste metal. Cut the iron or brass into disks or round pieces. Then, using perfectly flat-headed nails or tacks, like artists' drawing tacks, or *punaises*, fasten down one on a board, and then another lapping over it. The result will be a series of scales like those of a fish. This, when combined with painting or carving, may be used to produce very good results, which may be heightened by employing matting, outlining, graving, and gilding on the scales. The scales may be oval, shaped like the ends of hearts, scolloped, shaped like sorrel leaves, ivy leaves, or several leaves together of any kind in a sprig. Brass or iron, copper or German silver scales, placed alternately, look very well. Fig. 120.

We can buy at most metal or curiosity shops, or founders, masks

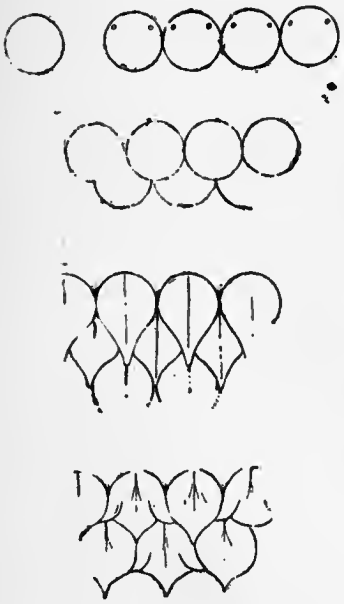


Fig. 120.

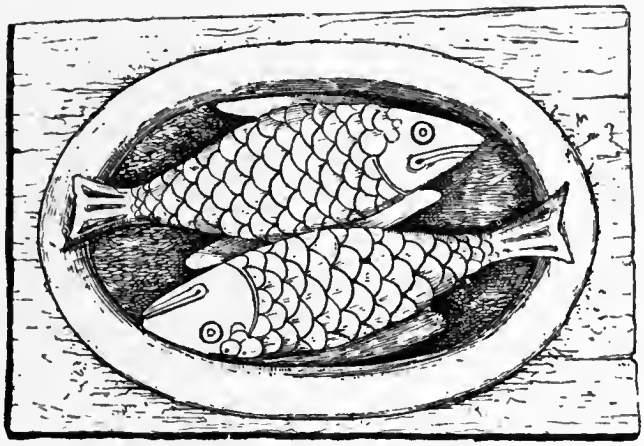


Fig. 121. Scale Work on Wood.

or medallions or ornaments in relief which can be used as centres for scale work. In fastening the scales, a nail or tack should be driven into the upper right and left-hand corners.

Tinmen have a contrivance by means of which small disks or round pieces of any kind of sheet metal are cut out. Any of them would, for a moderate sum, cut out any quantity of scales from thin brass or iron. Large figures of knights or dragons thus covered with scales form very striking mural decorations. Chinese often use the small coins known as *cash* for this purpose. Figs. 121, 122.

Fig. 122. Scale Work on Panel.

STENCIL CUTTING.

STENCILLING is painting patterns or pictures over open spaces cut in thin sheet metal, cardboard, or wood. The latter are seldom used; but fret-sawed boards, when the patterns have been sawed out, can, by bevelling or sloping down the edges, be very often used for stencils. That is to say, if we take a sheet of anything, cut a leaf out from it (Fig. 29), and then lay it on another sheet of paper on

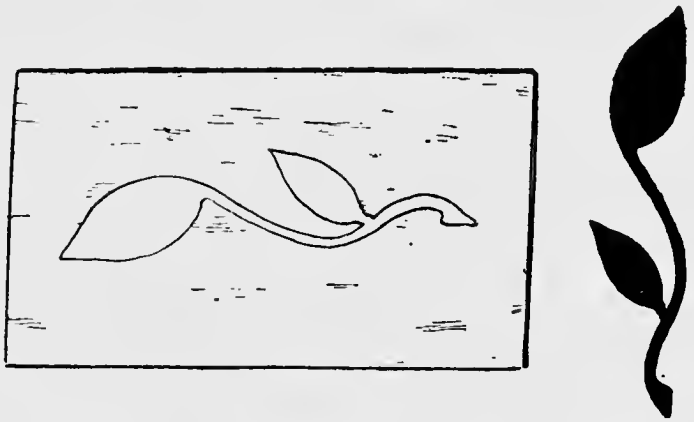


Fig. 123. STENCIL PLATE AND PATTERN.

the wall, etc., and brush it over with colour, when the stencil is removed we find the leaf painted in one uniform flat or dead colour. When this is dried we can, with another stencil, add the shade.

Stencilling can of course be executed with different stencils in as many colours. When retouched by hand with a brush very good pictures may be thus executed, especially for wall and ceiling decoration. This is carried to a great extent in Italy. I am writing this in a room in a *palazzo* in Florence, which once belonged to Mme. Ristori, which is profusely decorated with

stencilled-retouched subjects which have all the appearance of well-executed paintings.

Stencil cutting in sheet metal for small or fine work applicable to paper or boxes of white wood is executed by fret-sawing, or by cutting with a tool like a graver. In cardboard only a penknife is needed.

It is necessary when cutting out a stencil to leave uncut many spaces or places which do not belong to the pattern, and which

Fig. 124.

are necessary to hold the stencil-plate together. Fig. 124. These are generally *painted out* after the colouring. If these *necks* or *ties* were not left, the pattern would buckle up or bend, so that the stencil could not be used. Sometimes, for bold mural or wall work, they are left untouched. They correspond in effect exactly to the clamps used in bent or strip metal work.

Stencilling is well adapted to lettering or inscriptions. It is a long and tedious process to draw and fill in a motto, say in

Gothic or black letter; but if we have an alphabet ready cut we can very rapidly mark out a motto, letter by letter, with the stencils.

There are in every city men who cut stencils, generally for lettering on boxes, who will supply the sheet metal and tools, and give instruction as to their use.

Any person who can trace or draw a pattern can fret-saw or cut it out from sheet metal, and painting over it is a merely mechanical process which only demands care. In this way any blank wall can be easily ornamented. Let the pupil begin by stencilling on sheets of paper—the back of any wall-paper is best for this purpose—and after a few trials he will be able to make ornaments or an inscription for the frieze or cornice of a room.

Those who cannot draw may make stencils by taking figures of animals, such as are sold in sheets for children, or other easy designs, pasting them on thin wood or metal, and sawing them out.

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